General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.
- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.
- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.
- This document is paginated as submitted by the original source.
- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

Produced by the NASA Center for Aerospace Information (CASI)

UNIVERSITY OF
SOUTHERN CALIFORNIA

CIVIL ENGINEERING DEPARTMENT
Los Angeles, CA 90007

FINITE ELEMENT ANALYSIS
OF LAMINATED PLATES AND SHELLS

(NASA-CR-157107) FINITE ELEMENT ANALYSIS OF LAMINATED PLATES AND SHELLS, VOLUME 2 Annual Progress Report, Mar. 1977 - Mar. 1978 (University of Southern Calif.) 164 p HC A08/MF A01 CSCL 20K G3/39
N78-24578
Unclas
20793

PAUL SEIDE

AND

PETER N.-H. CHANG

JUN 1978
RECEIVED
NASA STI FACILITY

ANNUAL PROGRESS REPORT

MARCH 1977 - MARCH 1978

Volume 2

NASA Grant No. 1401

University of Southern California
University Park
Los Angeles, California 90007

FINITE ELEMENT ANALYSIS OF LAMINATED PLATES AND SHELLS

Paul Seide

and

Peter N.-H. Chang

Annual Progress Report

March 1977 - March 1978

Volume 2

NASA Grant No. NSG 1401

APPENDIX A: COMPUTER PROGRAM FOR LAMINATED PLATE AND CYLINDRICAL SHELL ANALYSIS

```
MAIN.   LASHEL.FOR      FORTRAN V.5A(621) /KI   23-MAY-78       12:36   PAGE 1

      IMPLICIT REAL*8(A-H,O-Z)
      REAL T,TT,S,ST,HED
      LOGICAL ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH,GEOST
      COMMON /GAR/ A(9999)
      COMMON /JUNK /HED(18),JUK(400)
      COMMON /ELPAR/ NPAR(14),NUMNP,MBAND,NELTYP,N1,N2,N3,N4,N5,MTOT,NEQ
      COMMON /EM   / QQQ(2847)
      COMMON /DYN/    IDUB(11),NDYN,THDPCH,THSPCH
      COMMON /TAPES/ NQQ(6)
      COMMON /EXTRA/ MODEX,NT8,NIOSV,NT10,KEQB,NUMEL,T(12),S(12)
      COMMON /SOL/    NBLOCK,NEQB,LL,NF,IDUM,NEIG,NAD,NVV,ANORM,NFO
      COMMON /CTL/ GRAV,ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH,INTCG,
     1               MINBND,IPLT,NPLOTS,NPLT,JNKK(10)
      COMMON /GEOSTF/ GEOST,NELGEO
      COMMON/SEIS/NRSC,KAPG,NRS,IT,DDATE,JFLAG
C
C
C
      OPEN(UNIT= 1,DEVICE='DSK',FILE='CC01.DAT')
      OPEN(UNIT= 2,DEVICE='DSK',FILE='CC02.DAT')
      OPEN(UNIT= 3,DEVICE='DSK',FILE='CC03.DAT')
      OPEN(UNIT= 4,DEVICE='DSK',FILE='CC04.DAT')
      OPEN(UNIT= 5,DEVICE='DSK',FILE='S205.DAT')
      OPEN(UNIT= 6,DEVICE='DSK',FILE='S206.DAT')
      OPEN(UNIT= 7,DEVICE='DSK',FILE='CC07.DAT')
      OPEN(UNIT= 8,DEVICE='DSK',FILE='CC08.DAT')
      OPEN(UNIT= 9,DEVICE='DSK',FILE='CC09.DAT')
      OPEN(UNIT=10,DEVICE='DSK',FILE='CC10.DAT')
      OPEN(UNIT=12,DEVICE='DSK',FILE='CC12.DAT')
      OPEN(UNIT=13,DEVICE='DSK',FILE='CC13.DAT')
      OPEN(UNIT=14,DEVICE='DSK',FILE='CC14.DAT')
      OPEN(UNIT=15,DEVICE='DSK',FILE='CC15.DAT')
C
C
      NPLOTS=0
    5 CALL  HEDPRT(KDYN)
      JFLAG=0
      WRITE (13) HED
C
C
C
C
C     I N P U T    J O I N T    D A T A
C
      N2=N1+6*NUMNP
      N3=N2+NUMNP
      N4=N3+NUMNP
      N5=N4+NUMNP
      N6=N5+NUMNP
      CALL  ERROR(N6)
C
      READ  (5,1001) NPAR
      CALL INPUTJ (A(N1),A(N2),A(N3),A(N4),A(N5))
C
C     STORE THE NODAL COORDINATES FOR LATER USE
C
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      WRITE (13) (A(I),I=N2,N5)
C
C     F O R M   E L E M E N T   S T I F F N E S S E S
C
C
      MBAND=0
      NUMEL=0
C
C***  DATA PORTHOLE SAVE
      IF(MODEX.EQ.1) WRITE (NT8,*) NPAR
      NT1=1
      IF (MINBND .GE. 1 .AND. MODEX .EQ. 0) NT1=4
      IF (MINBND .GE. 1 .AND. MODEX .EQ. 1) NT1=7
      WRITE (NT1) NPAR
      NUMEL=NUMEL+NPAR(2)
      MTYPE=NPAR(1)
C
      CALL  ELTYPE(MTYPE)
C
C
C     ADD AN END-OF-FILE FLAG ON FILE 13
C
      M=-1
      IF (IPLT .GT. 0)
     XWRITE(13) M,M
C
C
C     D E T E R M I N E   B L O C K S I Z E
C
C     ADDSTF
C
      NEQB=(MTOT - 4*LL)/(MBAND + LL + 1)/2
C
C     OVER-RIDE THE SYSTEM MATRIX BLOCKSIZE WITH THE INPUT (NON-ZERO)
C     VALUE. KEQB.
C     THIS OVER-RIDE ENTRY IS TO ALLOW PROGRAM CHECKING OF MULTI-
C     BLOCK ALGORITHMS WITH WHAT WOULD NORMALLY BE ONE BLOCK DATA.
C
      IF(KEQB.LT.NEQB) NEQB = KEQB
C
C
C     STATIC SOLUTION
C
  690 CONTINUE
      NEQB1=(MTOT - MBAND)/(2*(MBAND+LL) + 1)
      NEQB2=(MTOT - MBAND - LL*(MBAND-2))/(3*LL + MBAND + 1)
      IF (NEQB1.LT.NEQB) NEQB=NEQB1
      IF (NEQB2.LT.NEQB) NEQB=NEQB2
      NBLOCK = (NEQ-1)/NEQB +1
      IF(NEQB.GT.NEQ) NEQB=NEQ
      IF(IPLT.EQ.0)GO TO 695
      NTOT=20*NUMNP+NEQB*NBLOCK*LL
      IF(MTOT.GT.NTOT)GO TO 790
      WRITE(6,2020)NTOT
      MODEX=1
  695 NTOT=6*NUMNP+NEQB*NBLOCK*LL+1
```

```
      IF(MTOT.GT.NTOT)GO TO 790
      WRITE(6,2030)NTOT
      MODEX=1
      GO TO 790
C
C
  790 IF (NEQB .GE. 2) GO TO 792
      IF (NEQ .LT. 3) GO TO 792
      WRITE (6,2010) NEQB
      NEQB=2
      NBLOCK=(NEQ-1)/NEQB + 1
      MODEX=1
792   CONTINUE
C
C     I N P U T   N O D A L   L O A D S
C
      NSB=NEQB*NBLOCK
      N2=N1+6*NUMNP
      N3=N2+LL*NSB
      N4=N3+NSB
      CALL  ERROR(N4)
      WRITE (6,201) NEQ,MBAND,NEQB,NBLOCK
C
C
      CALL  INL(A(N1),A(N2),A(N3),NUMNP,NEQB,NSB,LL,NBLOCK)
C
C
C     CHECK FOR UNRESTRAINED DEGREES OF FREEDOM
C
      N3=N2+NEQ
      CALL  CHECK(A(N1),A(N2),NEQ,NUMEL,NELTYP)
C
C     F O R M   T O T A L   S T I F F N E S S
C
      NE2B=2*NEQB
      N2=N1+NEQB*MBAND
      N3=N2+NEQB*LL
      N4=N3+4*LL
      NN2=N1+NE2B*MBAND
      NN3=NN2+NE2B*LL
      NN4=NN3+4*LL
C
      CALL  ADDSTF (A(N1),A(NN2),A(NN3),A(NN4),NUMEL,NBLOCK,NE2B,LL,MBAN
     XD,ANORM,NVV)
C
   18 CONTINUE
C
C     S O L U T I O N   P H A S E
C
C
C     STATIC SOLUTION
C
   30 IF(MODEX.EQ.0) GO TO 32
      GO TO 90
C
   32 REWIND 12
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
        CALL  SOLEQ
        IF (.NOT. GEOST) GO TO 90
        WRITE (6,2000) NUMEL,NELGED
C
C
C
C
   90   GO TO 5
C
   201 FORMAT (38H1E Q U A T I O N   P A R A M E T E R S, //
     X          34H  TOTAL NUMBER OF EQUATIONS      =,I5,
     X         /34H  BANDWIDTH                      =,I5,
     X         /34H  NUMBER OF EQUATIONS IN A BLOCK =,I5,
     X         /34H  NUMBER OF BLOCKS               =,I5)
   203 FORMAT (1H1,31H0 V E R A L L   T I M E   L O G, //
     X 5X,30HNODAL POINT INPUT               =,  F8.2 /
     X 5X,30HELEMENT STIFFNESS FORMATION     =,  F8.2 /
     X 5X,30HNODAL LOAD INPUT                =,  F8.2 /
     X 5X,30HTOTAL STIFFNESS FORMATION       =,  F8.2 /
     X 5X,30HSTATIC ANALYSIS                 =,  F8.2 /
     X 5X,30HEIGENVALUE EXTRACTION           =,  F8.2 /
     X 5X,30HSTRUCTURE PLOTTING              =,  F8.2 /
     X 5X,30HFORCED RESPONSE ANALYSIS        =,  F8.2 /
     X 5X,30HRESPONSE SPECTRUM ANALYSIS      =,  F8.2 /
     X 5X,30HSTEP-BY-STEP INTEGRATION        =,  F8.2 /
     X 5X,30HFREQUENCY RESPONSE ANALYSIS     =,  F8.2 //
     X 5X,30HTOTAL SOLUTION TIME             =,  F8.2 /)
C
C
C
  1001 FORMAT (14I5)
  2000 FORMAT ('0TOTAL NUMBER OF ELEMENTS                          =',I5,/,
     X           ' NUMBER OF ELEMENTS WITH GEOMETRIC STIFFNESS=',I5)
  2010 FORMAT ('0*** WARNING *** THE AVAILABLE BLANK COMMONT (MTOT) IS',
     A' TOO SMALL',/,' COMPUTED NO. OF EQUATIONS PER BLOCK=',I10,/,
     X' PROCEED IN THE DATA CHECK MODE WITH NEQB=2')
  2020 FORMAT('0*** FATAL ERROR *** AVAILABLE CORE IS TOO SMALL'
     1,' FOR PLOTTING, REQUIRED MTOT=',I10/
     2'  CONTINUE IN THE DATA CHECK MODE')
  2030 FORMAT('0*** FATAL ERROR ***  AVAILABLE CORE IS INADAQUATE'
     1,'  REQUIRED MTOT=',I10/'CONTINUE IN THE DATA CHECK MODE')
        END

COMMON BLOCKS

/GAR/(+47036)
A       +0
/JUNK/(+642)
HED     +0        JUK      +22

/ELPAR/(+30)
NPAR    +0        NUMNP    +16      MBAND    +17      NELTYP  +20      N1      +21
N2      +22       N3       +23      N4       +24      N5      +25      MTOT    +26
NEQ     +27
/EM/(+13076)
```

```
MAIN.   LASHEL.FOR       FORTRAN V.5A(621) /KI    25-MAY-78        12:38   PAGE 1-4


DQQ      +0
/DYN/(+20)
IDUS     +0         NDYN     +13      THDPCH  +14      THSPCH  +16

/TAPES/(+6)
NQQ      +0
/EXTRA/(+36)
MODEX    +0         NT8      +1       N10SV   +2       NT13    +3       KEQB     +4
NUMEL    +5         T        +6       S       +22

/SOL/(+13)
NBLOCK   +0         NEQB     +1       LL      +2       NP      +3       IDUM     +4
NEIG     +5         NAD      +6       NVV     +7       ANOR4   +10      NFO      +12

/CTL/(+26)
GRAV     +0         ELPRT    +2       ELPCH   +3       GENPRT  +4       GENPCH   +5
DEFPCH   +6         IWTCG    +7       MINBND  +10      IPLT    +11      NPLOTS   +12
NPLT     +13        JNKK     +14

/GEOSTF/(+2)
GEOST    +0         NELGEO   +1

/SEIS/(+7)
NRSC     +0         KAPG     +1       NRS     +2       IT      +3       DDATE    +4
JFLAG    +6

SUBPROGRAMS CALLED

ADDSTF   SOLEQ    HEDPRT   ELTYPE   CHECK    ERROR
INPUTJ   INL

SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*NN2     1          *NTOT    2        %SF                      *N6     3        *NN3     4
*NE2B    5          *M       6        *NN4    7                *N5B    10       .S0000  11
*NEQB2   12         *NT1     13       *KDYN   14               *MTYPE  15       *NEQB1   16
*I       17         %TT

TEMPORARIES

 .O0000 421          .O0001 422        .O0002 423        .O0003 424        .O0004 425

MAIN.    [ NO ERRORS DETECTED ]
```

```
      SUBROUTINE ADDSTF (A.B.STR.TMASS.NUMEL.NBLOCK.NE2B.LL.MBAND.ANORM.
     1NVV)
C
      IMPLICIT REAL*8(A-H.O-Z)
      LOGICAL ELPRT.ELPCH.GENPRT.GENPCH.DEFPCH
      REAL PCT
C
C     CALLED BY    MAIN
C
C     FORMS GLOBAL EQUILIBRIUM EQUATIONS IN BLOCKS
C
      DIMENSION A(NE2B.MBAND).B(NE2B.LL).STR(4.LL).TMASS(NE2B)
C
      COMMON /DYN/    NT.NUT.ALFA.DT.BETA.NFN.NGM.NAT.NDYN
      COMMON /EM/ LRD.ND.LM(63).IPAD.SS(2331)
      COMMON /EXTRA/ MODEX.NT8
      COMMON /CTL/ GRAV.ELPRT.ELPCH.GENPRT.GENPCH.DEFPCH
C
      NEQB=NE2B/2
      K=NEQB+1
      X=NBLOCK
      MB=DSQRT(X)
      MB=MB/2+1
      NEBB=MB*NE2B
      MM=1
      NDEG=0
      NVV=0
      ANORM=0.D0
      AMIN=1.0D30
      AMAX=-AMIN
      NSHIFT=0
      NNZTRM=0
      REWIND 3
      REWIND 4
      REWIND 9
C
C     READ ELEMENT LOAD MULTIPLIERS
C
      WRITE (6.2000)
      DO 50 L=1.LL
      READ  (5.1002)    (STR(I.L).I=1.4)
   50 WRITE (6.2002) L.(STR(I.L).I=1.4)
      IF(MODEX.EQ.0) WRITE (8.*) STR
C
C     FOR A STEP-BY-STEP ANALYSIS  (NDYN.EQ.4)  READ THE SOLUTION
C     CONTROL CARD.  THE TIME STEP (DT) AND THE DAMPING COEFFICIENTS
C     (ALFA/BETA) ARE REQUIRED FOR THE ASSEMBLY OF THE EFFECTIVE
C     SYSTEM STIFFNESS MATRIX IN THIS ROUTINE.
C
      IF(NDYN.NE.4) GO TO 65
C
      READ  (5.1004) NFN.NGM.NAT.NT.NUT.DT.ALFA.BETA
      WRITE (6.2004) NFN.NGM.NAT.NT.NUT.DT.ALFA.BETA
      IF(NAT.EQ.0) NAT = 1
      IF(NUT.EQ.0) NUT = 1
      IF(DT.GT.1.0D-12) GO TO 55
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      WRITE (6,3000)
      STOP
C
C     COMPUTE INTEGRATION COEFFICIENTS FOR ASSEMBLY OF EFFECTIVE
C     SYSTEM STIFFNESS (STEP-BY-STEP ANALYSIS ONLY)
C
   55 TETA = 1.4D0
      DT1  = TETA*DT
      DT2  = DT1**2
      AO   = (6.D0+3.D0*ALFA*DT1)/(DT2+3.D0*BETA*DT1)
C
   65 IF(MODEX.EQ.1) RETURN
C
C     FORM EQUATIONS IN BLOCKS      ( 2 BLOCKS AT A TIME)
C
      DO 1000 N=1,NBLOCK ,2
      DO 100 I=1,NE2B
      DO 100 J=1,MBAND
  100 A(I,J)=0.D0
      READ(3)((B(I,L),I=1,NEQB),L=1,LL),(TMASS(I),I=1,NEQB)
      IF (N.EQ.NBLOCK) GO TO 110
      READ(3)((B(I,L),I=K,NE2B),L=1,LL),(TMASS(I),I=K,NE2B)
  110 CONTINUE
C
      REWIND 7
      REWIND 2
      NA=7
      NUME=NUM7
      IF (MM.NE.1) GO TO 120
      NA=2
      NUME=NUMEL
      NUM7 =0
C
  120 DO 700 N=1,NUME
      READ(NA) LRD,ND,(LM(I),I=1,ND),(SS(I),I=1,LRD)
      NSHFT=ND*(ND+1)/2+4*ND
      DO 160 I=1,ND
      LMN=1-LM(I)
      II=LM(I)-NSHIFT
      IF (II.LE.0.OR.II.GT.NE2B) GO TO 160
      IMS=I+NSHFT
      TMASS(II)=TMASS(II)+ SS(IMS)
      DO 130 L=1,LL
      DO 130 J=1,4
      KK=ND*(ND+1)/2+ND*(J-1)
  130 B(II,L)=B(II,L)+SS(I+KK)*STR(J,L)
      DO 150 J=1,ND
      JJ=LM(J)+LMN
      IF(JJ) 150,150,132
  132 IF (J-I) 140,134,134
  134 KK=(I-1)*ND-I*(I-1)/2+J
      GO TO 145
  140 KK=(J-1)*ND-J*(J-1)/2+I
  145 A(II,JJ)=A(II,JJ) + SS(KK)
  150 CONTINUE
  160 CONTINUE
```

```
C
C     DETERMINE IF STIFFNESS IS TO BE PLACED ON TAPE 7
C
      IF (MM.GT.1) GO TO 700
      DO 200 I=1,ND
      II=LM(I) -NSHIFT
      IF(II.GT.NE2B.AND.II.LE.NEBB) GO TO 210
  200 CONTINUE
      GO TO 700
  210 WRITE(7) LRD,ND,(LM(I),I=1,ND),(SS(I),I=1,LRD)
      NUM7=NUM7+1
C
  700 CONTINUE
      DO 710 L=1,NEQB
      ANORM=ANORM + A(L,1)
      IF (A(L,1) .NE. 0.0D0 .AND. A(L,1) .LT. AMIN) AMIN=A(L,1)
      IF (A(L,1) .GT. AMAX) AMAX=A(L,1)
      IF (A(L,1).NE.0.D0) NDEG=NDEG + 1
      IF (A(L,1).EQ.0.D0) A(L,1)=1.D+20
      IF (TMASS(L).NE.0.D0) NVV=NVV + 1
      DO 710 KAPG=1,MBAND
      IF (A(L,KAPG) .NE. 0.0D0) NNZTRM=NNZTRM+1
  710 CONTINUE
C
C     FOR STEP-BY-STEP ANALYSIS ADD THE MASS CONTRIBUTIONS TO
C     THE EQUATION DIAGONAL COEFFICIENTS
C
      IF(NDYN.NE.4) GO TO 730
      DO 720 I=1,NEQB
  720 A(I,1) = A(I,1) + A0* TMASS(I)
      WRITE (4) ((A(I,J),I=1,NEQB),J=1,MBAND)
      GO TO 740
  730 WRITE(4)((A(I,J),I=1,NEQB),J=1,MBAND),((B(I,L),I=1,NEQB),L=1,LL)
  740 WRITE(9) (TMASS(I),I=1,NEQB)
C
      IF (.NOT. GENPRT) GO TO 770
      WRITE (6,2006) M
      DO 750 I=1,NEQB
      IF (GENPCH) WRITE (11,2007)(A(I,J),J=1,MBAND)
  750 WRITE (6,2008)(A(I,J),J=1,MBAND)
      WRITE (6,2009)
      DO 760 I=1,NEQB
      IF (GENPCH) WRITE (11,2007)(B(I,J),J=1,LL)
  760 WRITE (6,2008)(B(I,J),J=1,LL)
      WRITE (6,2010)
      IF (GENPCH) WRITE (11,2007)(TMASS(I),I=1,NEQB)
      WRITE (6,2008)(TMASS(I),I=1,NEQB)
  770 IF(M.EQ.NBLOCK) GO TO 1000
      DO 780 L=K,NE2B
      ANORM=ANORM + A(L,1)
      IF (A(L,1) .NE. 0.0D0 .AND. A(L,1) .LT. AMIN) AMIN=A(L,1)
      IF (A(L,1) .GT. AMAX) AMAX=A(L,1)
      IF (A(L,1).NE.0.D0) NDEG=NDEG + 1
      IF (A(L,1).EQ.0.D0) A(L,1)=1.D+20
      IF (TMASS(L).NE.0.D0) NVV=NVV + 1
      DO 780 KK=1,MBAND
      IF (A(L,KK) .NE. 0.0D0) NNZTRM=NNZTRM+1
  780 CONTINUE
C
      IF(NDYN.NE.4) GO TO 800
      DO 790 I=K,NE2B
  790 A(I,1) = A(I,1) + A0* TMASS(I)
      WRITE(4) ((A(I,J),I=K,NE2B),J=1,MBAND)
      GO TO 810
  800 WRITE(4)((A(I,J),I=K,NE2B),J=1,MBAND),((B(I,L),I=K,NE2B),L=1,LL)
  810 WRITE (9) (TMASS(I),I=K,NE2B)
      IF (.NOT. GENPRT) GO TO 840
      MP1=M+1
      WRITE (6,2006) MP1
      DO 820 I=K,NE2B
      IF (GENPCH) WRITE (11,2007)(A(I,J),J=1,MBAND)
  820 WRITE (6,2008)(A(I,J),J=1,MBAND)
      WRITE (6,2009)
      DO 830 I=K,NE2B
      IF (GENPCH) WRITE (11,2007)(B(I,J),J=1,LL)
  830 WRITE (6,2008)(B(I,J),J=1,LL)
      WRITE (6,2010)
      IF (GENPCH) WRITE (11,2007)(TMASS(I),I=K,NE2B)
      WRITE (6,2008)(TMASS(I),I=K,NE2B)
C
  840 IF (MM.EQ.MB) MM=0
      MM=MM+1
 1000 NSHIFT=NSHIFT+NE2B
      IF (NDEG.GT.0) GO TO 850
      WRITE (6,1010)
      STOP
  850 ANORM=(ANORM/NDEG)*1.D-8
      NTERM=NEQB*NBLOCK*MBAND
      PCT=100.0D0*DFLOAT(NNZTRM)/DFLOAT(NTERM)
      RATIO=1.0D30
      IF (AMIN .NE. 0.0D0) RATIO=AMAX/AMIN
      AAVG=ANORM*1.0D8
      WRITE (6,2020) AMIN,AMAX,RATIO,AAVG,PCT
C
      RETURN
 1002 FORMAT (4F10.0)
 1004 FORMAT (5I5,3F10.0)
 1010 FORMAT (51H0STRUCTURE WITH NO DEGREES OF FREEDOM  CHECK DATA    )
 2006 FORMAT (/// 10H STRUCTURE,13X,7HELEMENT,4X,4HLOAD,4X,
     X 11HMULTIPLIERS,/ 10H LOAD CASE,12X,1HA,9X,1HB,9X,1HC,9X,1HD,/ 1X)
 2002 FORMAT (I6,/X,4F10.3)
 2004 FORMAT (45H1S T E P - B Y - S T E P   S O L U T I O N   ,
     X          37HC O N T R O L   I N F O R M A T I O N, ///
     X 5X, 35HNUMBER OF TIME VARYING FUNCTIONS  =, I5     //
     X 5X, 35HGROUND MOTION INDICATOR           =, I5     /
     X 8X, 10HEQ.0, NONE, /
     X 8X, 29HGT.0, READ ACCELERATION INPUT, //
     X 5X, 35HNUMBER OF ARRIVAL TIMES           =, I5     /
     X 8X, 26HEQ.0, ALL FUNCTIONS ARRIVE, /
     X 8X, 18H       AT TIME ZERO, //
     X 5X, 35HNUMBER OF SOLUTION TIME STEPS     =, I5     //
     X 5X, 35HOUTPUT (PRINT) INTERVAL           =, I5     //
```

```
             X 5X, 35HSOLUTION TIME INCREMENT                =, E14.4 //
             X 5X, 30HMASS-      PROPORTIONAL DAMPING, /
             X 5X, 35HCOEFFICIENT (ALFHA)                    =, E14.4 //
             X 5X, 30HSTIFFNESS-PROPORTIONAL DAMPING, /
             X 5X, 35HCOEFFICIENT (BETA)                     =, E14.4 /// 1X)
        2005 FORMAT (I6,7X,4F10.3)
        2006 FORMAT ('1OVERALL MATRICES, BLOCK',I3,//,
             X            ' STIFFNESS MATRIX ')
        2007 FORMAT ((1P8E10.3))
        2008 FORMAT (/,(1H ,1P10D13.4))
        2009 FORMAT (///,' LOAD MATRIX ')
        2010 FORMAT (///,' MASS MATRIX ')
        2020 FORMAT ('0STIFFNESS MATRIX PARAMETERS',//,
             X 10X,'MINIMUM NON-ZERO DIAGONAL ELEMENT=',1PD10.3,/,
             X 10X,'MAXIMUM DIAGONAL ELEMENT         =',  D10.3,/,
             X 10X,'MAXIMUM/MINIMUM                  =',  D10.3,/,
             X 10X,'AVERAGE DIAGONAL ELEMENT         =',  D10.3,/,
             X 10X,'DENSITY OF THE MATRIX            =',0PF5.1,' PCT.')
        3000 FORMAT (27H0*** ERROR   ZERO TIME STEP, / 1X)
             END

COMMON BLOCKS

/DYN/(+14)
NT       +0       NDT      +1       ALFA     +2       DT       +4       BETA     +6
NFN      +10      NGM      +11      MAT      +12      NDYN     +13

/EM/(+11170)
LRD      +0       ND       +1       LM       +2       IPAD     +101     SS       +102

/EXTRA/(+2)
MODEX    +0       NTB      +1

/CTL/(+7)
GRAV     +0       ELPRT    +2       ELPCH    +3       GENPRT   +4       GENPCH   +5
DEFPCH   +6

SUBPROGRAMS CALLED

DFLOT.   DSQRT.

SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

 .S0020 1         *TETA    2         .I0011 4         *LL      5         *AMIN    6
 .I0010 10        *JJ      11        *NEQB    12        *IMS     13        *DT1     14
*NTERM  16         .S0037 17         .S0036 20         .S0035 21        *NBLOCK  22
 .S0034 23        *N       24        *NDEG    25         STR     26         .S0033 27
 .S0032 30        *K       31         .S0031 32         .S0030 33         B       34
*RATIO  35         .S0047 37        *NA      40        *AMAX    41         .S0046 43
*NUMEL  44         .S0045 45        *NNZTRM  46         .S0044 47         .S0043 50
 .S0042 51        *DT2     52         .S0041 54         .S0040 55        *ANORM   56
*NE2B   60        *NSHIFT  61        *NB      62         .S0057 63        *M       64
 .S0056 65         .S0055 66        *J       67        *MM      70         .S0054 71
 .S0053 72         .S0007 73         .S0052 74        *KK      75         .S0006 76
```

```
ADDSTF  LASHEL.FOR      FORTRAN V.5A(621) /KI   23-MAY-78        12:36   PAGE 1-5

 .S0051 77        .S0005 100       .S0050 101       .S0004 102      *I1      103
 .S0003 104       A      105       .S0002 106       .S0001 107      *NVV     110
 .S0000 111      *LMN    112      *NUME   113       .S0067 114       .S0066 115
 .S0065 116       .S0064 117      *MPI    120       .S0063 121       .S0017 122
*X      123       .S0062 125       .S0016 126       PCT    127       .S0061 130
 .S0015 131      *AD     132       .S0060 134      *KAPJ   135       .S0014 136
 .I0007 137       .S0013 140       .I0006 141      *NUM7   142       .S0012 143
 .I0005 144       .S0011 145       .I0004 146       .S0010 147       .I0003 150
*L      151       .I0002 152      *MBAND  153       .I0001 154      *AAVG    155
*I      157       .I0000 160       TMASS  161      *NEDD   162       .S0027 163
 .S0026 164       .S0071 165       .S0025 166      *MSHFT  167       .S0070 170
 .S0024 171       .S0023 172       .S0022 173       .S0021 174

TEMPORARIES

 .A0016 616

ADDSTF  [ NO ERRORS DETECTED ]
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
CALBAN  LASHEL.FOR       FORTRAN V.5A(621) /KI   23-MAY-76        12:38   PAGE 1

        SUBROUTINE CALBAN (MBAND,NDIF,LM,XM,S,P,ND,NDM,NS)
        IMPLICIT REAL*8(A-H,O-Z)
        LOGICAL ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH
C
C       CALLED BY   RUSS,TEAM,PLNAX,BRICK8,TPLATE,CLAMP,ELST3D,PIPEK
C
C-----CALCULATES BAND WIDTH AND WRITES STIFFNESS MATRIX ON TAPE 2
        DIMENSION LM(1),XM(1),S(NDM,NDM),P(NDM,4)
        COMMON /EXTRA/ MODEX,NT8
        COMMON /CTL/ GRAV,ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH,
      1   IWTCG,MINBND,IPLT
        NF1=2
        IF (MINBND .GE. 1) NF1=7
        NF2=1
        IF (MINBND .GE. 1) NF2=7
        MIN=100000
        MAX=0
        DO 800 L=1,ND
        IF (LM(L).EQ.0) GO TO 800
        IF (LM(L).GT.MAX) MAX=LM(L)
        IF (LM(L).LT.MIN) MIN=LM(L)
    800 CONTINUE
        NDIF=MAX-MIN+1
        IF (NDIF .LT. 0) NDIF=0
        IF (NDIF.GT.MBAND) MBAND=NDIF
        IF(MODEX.EQ.1) GO TO 810
C
        LRD=ND*(ND+1)/2+5*ND
        WRITE(NF1) LRD,ND,(LM(I),I=1,ND),((S(I,J),J=1,ND),I=1,ND),
      X ((P(I,J),I=1,ND),J=1,4),(XM(I),I=1,ND)
        IF (.NOT. ELPRT) RETURN
        WRITE (6,1000)(LM(I),I=1,ND)
        WRITE (6,1010)
        DO 900 I=1,ND
        IF (ELPCH) WRITE (11,1020)(S(I,J),J=1,ND)
    900 WRITE (6,1030)(S(I,J),J=1,ND)
        IF (ELPCH) WRITE (11,1020)((P(I,J),J=1,4),I=1,ND)
        WRITE (6,1040)((P(I,J),J=1,4),I=1,ND)
        IF (ELPCH) WRITE (11,1020)(XM(I),I=1,ND)
        WRITE (6,1050)(XM(I),I=1,ND)
        RETURN
    810 WRITE(NF2) ND,NS,(LM(I),I=1,ND)
        RETURN
C
   1000 FORMAT ('0ELEMENT LOCATION MATRIX ',/,(1H ,10I13))
   1010 FORMAT ('0ELEMENT STIFFNESS MATRIX ')
   1020 FORMAT ((1P8E10.3))
   1030 FORMAT (/,(1H ,1P10E13.4))
   1040 FORMAT ('0ELEMENT LOAD MATRIX ',/,(1H ,1P4E13.4))
   1050 FORMAT ('0ELEMENT MASS MATRIX ',/,(1H ,1P10E13.4))
        END

COMMON BLOCKS

/EXTRA/(+2)
```

```
CALBAN  LASHEL.FOR       FORTRAN V.5A(621) /KI   23-MAY-78        12:38   PAGE 1-1

MODEX   +0        NT8      +1

/CTL/(+12)
GRAV     +0         ELPRT    +2         ELPCH    +3         GENPRT   +4         GENPCH   +5
DEFPCH   +6         IWTCG    +7         MINBND   +10        IPLT     +11

SUBPROGRAMS CALLED


SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

 .S0020 1           *MIN     2          *NS      3          *NF1     4          *MAX     5
*NDM     6          *NDIF    7          *NF2     10          S       11          P       12
*J       13          .S0007 14           .S0006 15           .S0005 16           .S0004 17
 .S0003 20           .S0002 21           .S0001 22           .S0000 23           .S0017 24
 .S0016 25           .S0015 26           XM     27           .S0014 30          *ND      31
 .S0013 32           .S0012 33           .I0005 34           .S0011 35           .I0004 36
 .S0010 37           .I0003 40          *L       41          .I0002 42          *MBAND   43
 .I0001 44          *I       45          .I0000 46          LM       47          .S0021 50
*LRD     51

TEMPORARIES

 .A0016 122

CALBAN  [ NO ERRORS DETECTED ]
```

```
      SUBROUTINE CHECK(ID,IFLG,NEQ,NUMEL,NELTYP)
      IMPLICIT REAL*8(A-H,O-Z)
      LOGICAL ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH
C
C     CALLED BY MAIN
C
C     THIS SUBROUTINE CHECKS TO SEE THAT ALL DEGREES OF FREEDOM HAVE
C     STIFFNESS ATTACHED
C
      COMMON /ELPAR/ NPAR(14),NUMNP
      DIMENSION IFLG(NEQ),ID(NUMNP,6)
      COMMON /EM/ LRD,ND,LM(63),IPAD,SS(2331)
      COMMON /CTL/ GRAV,ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH,
     1  IWTCG,MINBND,IPLT
      COMMON /EXTRA/ MODEX
      NF=2
      IF (MODEX .EQ. 1) NF=1
C
C     SET THE CHECK VECTOR TO 1
C
      DO 100 I=1,NEQ
      IFLG(I)=1
100   CONTINUE
C
C     READ THE LM VECTOR FOR EACH ELEMENT AND SET THE CHECK VECTOR
C
C         DATA CHECK MODE IS OFF
C
      IF (MODEX .EQ. 1) GO TO 200
      REWIND NF
      DO 120 N=1,NUMEL
      READ (NF) LRD,ND,(LM(I),I=1,ND),(SS(I),I=1,LRD)
      DO 110 I=1,ND
      IEQ=LM(I)
      IF (IEQ .LE. 0) GO TO 110
      IFLG(IEQ)=0
110   CONTINUE
120   CONTINUE
      REWIND NF
      GO TO 400
C
C         DATA CHECK MODE ON, NO BANDWIDTH MINIMIZATION
C
200   IF (MINBND .GE. 1) GO TO 300
      REWIND NF
      DO 230 N=1,NELTYP
      READ (NF) NPAR
      NUME=NPAR(2)
      DO 220 J=1,NUME
      READ (NF) ND,NS,(LM(I),I=1,ND)
      DO 210 I=1,ND
      IEQ=LM(I)
      IF (IEQ .LE. 0) GO TO 210
      IFLG(IEQ)=0
210   CONTINUE
220   CONTINUE
```

```
 230  CONTINUE
      REWIND NF
      GO TO 400
C
C         DATA CHECK MODE ON WITH BANDWIDTH MINIMIZATION
C
 300  REWIND NF
      DO 330 N=1,NELTYP
      READ (NF) NPAR
      NUME=NPAR(2)
      DO 320 J=1,NUME
      READ (NF) ND,NS,(LM(I),I=1,ND)
      DO 310 I=1,ND
      IEQ=LM(I)
      IF (IEQ .LE. 0) GO TO 310
      IFLG(IEQ)=0
 310  CONTINUE
 320  CONTINUE
 330  CONTINUE
      REWIND NF
C
C     SCAN THROUGH THE CHECK VECTOR
C
 400  N=0
      DO 430 I=1,NEQ
      IF (IFLG(I) .EQ. 0) GO TO 430
      N=1
      MODEX=1
      DO 420 N=1,NUMNP
      DO 410 J=1,6
      IF(ID(N,J).NE.I)GO TO 410
      WRITE(6,2000)I,N,J
      GO TO 430
 410  CONTINUE
   420 CONTINUE
   430 CONTINUE
      IF (N .EQ. 0) WRITE (6,2010)
      RETURN
C
 2000 FORMAT('0EQUATION',I5,'    (NODE',I3,'   D.O.F.',I2,') HAS NO'
     1,' STIFFNESS.  CONTINUE IN THE DATA CHECK MODE')
 2010 FORMAT ('0ALL EQUATIONS HAVE STIFFNESS ATTACHED')
      END

COMMON BLOCKS

/ELPAR/(+17)
NPAR    +0      NUMNP   +16

/EM/(+11170)
LRD     +0      ND      +1      LM      +2      IPAD    +101    SS      +102

/CTL/(+12)
GRAV    +0      ELPRT   +2      ELPCH   +3      GENPRT  +4      GENPCH  +5
DEFPCH  +6      IWTCG   +7      MINDND  +10     IPLT    +11
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
CHECK   LASHEL.FOR       FORTRAN V.5A(621) /KI   25-MAY-76       12:38   PAGE 1-2


/EXTRA/(+1)
MODEX   +0

SUBPROGRAMS CALLED


SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*NS      1        *M       2        *NEQ     3        *NUMEL   4        *NF      5
 IFLG    6         ID      7        *J       10        .S0007 11        .S0006 12
 .S0005 13         .S0004 14         .S0003 15         .S0002 16         .S0001 17
 .S0000 20        *NUME    21         .S0017 22        *NELTYP 23         .S0016 24
 .S0015 25         .S0014 26         .S0013 27         .S0012 30         .S0011 31
 .I0004 32         .S0010 33         .I0003 34         .I0002 35         .I0001 36
*I       37        .I0000 40        *IEQ     41

TEMPORARIES

 .A0016 100

CHECK   [ NO ERRORS DETECTED ]
```

```
ELTYPE  LASHEL.FOR       FORTRAN V.5A(621) /KI   23-MAY-78        12:38   PAGE 1

06060           SUBROUTINE ELTYPE(MTYPE)
06070           IMPLICIT REAL*8(A-H,O-Z)
06080     C
06090     C
06100     C     CALLED BY   MAIN,STRESS
06110     C
06120           IF ((MTYPE-13)  .EQ. 0) GO TO 13
06130     C     IF ((MTYPE-14)  .EQ. 0) GO TO 13
06140        11 WRITE (6,100) MTYPE
06150           GO TO 900
06160     C
06170     C
06180     C     MULTIPLE LAYERED CYLINDERICAL SHELL
06190        13 CALL LAYSHL
06200       900 RETURN
06210     C
06220       100 FORMAT ('0ELEMENT',I4,' IS NOT IMPLEMENTED YET')
06230           END

SUBPROGRAMS CALLED

LAYSHL

SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*MTYPE   1

TEMPORARIES

 .A0016 13

ELTYPE  [ NO ERRORS DETECTED ]
```

```
ERROR    LASHEL.FOR       FORTRAN V.5A(621) /KI    23-MAY-78        12:58    PAGE 1

06240           SUBROUTINE ERROR(N)
06250           COMMON /ELPAR/ NPAR(14),NUMNP,MBAND,NELTYP,N1,N2,N3,N4,N5,MTOT,NEQ
06260           IF (N .GT. MTOT) GO TO 100
06270           WRITE (6,2000) N
06280           RETURN
06290   100     WRITE (6,2010) N,MTOT
06300           STOP
06310   2000    FORMAT ('0REQUIRED BLANK COMMON FOR THIS STEP=',I7)
06320   2010    FORMAT ('0***FATAL ERROR***',/,
06330          X' REQUIRED BLANK COMMON =',I10,/,
C6340          X' AVAILABLE BLANK COMMON=',I10)
06350           END

COMMON BLOCKS

/ELPAR/(+30)
NPAR     +0       NUMNP    +16      MBAND    +17      NELTYP   +20      N1       +21
N2       +22      N3       +23      N4       +24      N5       +25      MTOT     +26
NEQ      +27

SUBPROGRAMS CALLED


SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*N       1

TEMPORARIES

 .A0016 35

ERROR   [ NO ERRORS DETECTED ]
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      SUBROUTINE HEDPRT(KDYN)
      IMPLICIT REAL*8(A-H,O-Z)
      REAL *4 DAYTM,DDATE
      REAL *4 T,S,SGRAV,HED
C
C     CALLED BY   MAIN
C
      COMMON /GAR/ A(9999)
      LOGICAL ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH,GEOST
      COMMON /JUNK /HED(18),JJK(400)
      COMMON /ELPAR/ NPAR(14),NUMNP,MBAND,NELTYP,N1,N2,N3,N4,N5,MTOT,NEQ
      COMMON /EM   / QQQ(2509)
      COMMON /DYN/    IDUS(11),NDYN,THDPCH,THSPCH
      COMMON /TAPES/ NQQ(6)
      COMMON /EXTRA/ MODEX,NT8,N10SV,NT10,KEQB,NUMEL,T(12),S(12)
      COMMON /SOL/    NBLOCK,NEQB,LL,NF,IDUM,NEIG,NAD,NVV,ANORM,NFO
      COMMON /CTL/ GRAV,ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH,IWTCG,
     1             MINBND,IPLT,NPLOTS,NPLT
      COMMON /GEOSTF/ GEOST,NELGEO
      COMMON/SEIS/NRSC,KAPG,NRS,IIDUM,DDATE(2)
      COMMON/FORMAT/NA
      COMMON /DAYTIM/ DAYTM(5)
      DIMENSION IPRT(5)
C
C     PROGRAM CAPACITY CONTROLLED BY THE FOLLOWING TWO STATEMENTS ...
C
      MTOT= 9998
C
    5 REWIND 1
      REWIND 2
      REWIND 3
      REWIND 4
      REWIND 7
      REWIND 9
      REWIND 12
      REWIND 13
      REWIND 14
      NT8 = 8
      REWIND NT8
      NT10= 10
      REWIND NT10
      NELGEO=0
      N1=1
C
C     P R O G R A M   C O N T R O L   D A T A
C
      READ (5,100,END=990) HED,NUMNP,NELTYP,LL,NF,NDYN,MODEX,NAD,
     1                     KEQB,N10SV,IPRT,IWTCG,MINBND,IPLT,NRSC,GRAV
      NA=NUMNP
      IF (NUMNP.EQ.0) GO TO 990
      IF (GRAV .EQ. 0.D0) GRAV=386.4D0
      ELPRT =IPRT(5) .GE. 1
      ELPCH =IPRT(5) .EQ. 2
      GENPRT=IPRT(4) .GE. 1
      GENPCH=IPRT(4) .EQ. 2
      DEFPCH=IPRT(3) .EQ. 1
      IF(MODEX.GT.0) MODEX = 1
C
C     WRITE BLOCKLETTER HEADING FOR THE NEW PROBLEM
C
C     WRITE (6,2000)
C     WRITE (6,2001)
C     WRITE (6,350)
C
C     GET THE CURRENT DATE AND TIME
C
      CALL  DATE
      SGRAV=SNGL(GRAV)
      WRITE (6,200) HED,NUMNP,NELTYP,LL,NF,NDYN
      WRITE (6,201) MODEX,NAD,KEQB,N10SV,SGRAV
      WRITE (6,210) MTOT
      IF(KEQB.LT.2) KEQB = 99999
      IF (NDYN.NE.0) LL=1
      IF(LL.GE.1) GO TO 10
      WRITE (6,300)
      STOP
C***  DATA PORTHOLE SAVE
   10 IF(MODEX.EQ.1)
     XWRITE (NT8)   HED,NUMNP,NELTYP,LL,NF,NDYN
       IF (MINBND .GT. 0) WRITE (6,370)
       IF (IPLT .GT. 3) WRITE (6,380)
      IF(IPLT.LT.0)WRITE(6,390)
C
      KDYN = IABS(NDYN) +1
      GEOST=.FALSE.
       IF (KDYN.LE.6) RETURN
      KDYN=KDYN-10
      GEOST=.TRUE.
      WRITE (6,360)
      IF (KDYN .LE. 5) RETURN
      WRITE (6,310) NDYN
  990 CONTINUE
      IF(NPLOTS.GT.0)STOP
      REWIND 3
      WRITE (3) LL,NF,KDYN,NEQB,N2U,NBLOCK,MODEX,NUMNP
      STOP
  100 FORMAT (18A4,/,9I5,5I1,3I5,I5,F10.0)
  200 FORMAT (1H0,30X,18A4,/,
     X  38HIC O N T R O L   I N F O R M A T I O N, // 4X,
     X  27H NUMBER OF NODAL POINTS    =, I5 / 4X,
     X  27H NUMBER OF ELEMENT TYPES   =, I5 / 4X,
     X  27H NUMBER OF LOAD CASES      =, I5 / 4X,
     X  27H NUMBER OF FREQUENCIES     =, I5 / 4X,
     X  27H ANALYSIS CODE (NDYN)      =, I5 / 4X,
     X  16H    EQ.0,  STATIC,              / 4X,
     X  26H    EQ.1,  MODAL EXTRACTION,    / 4X,
     X  25H    EQ.2,  FORCED RESPONSE,     / 4X,
     X  27H    EQ.3,  RESPONSE SPECTRUM,   / 4X,
     X  28H    EQ.4,  DIRECT INTEGRATION,  / 4X,
     X  28H    EQ.5,  FREQUENCY RESPONSE)
  201 FORMAT (4X,
     X  27H SOLUTION MODE (MODEX)     =, I5 / 4X,
HEDPRT  LASHEL.FOR      FORTRAN V.5A(621) /KI   25-MAY-76       12:36   PAGE 1-2

07480         X   19H   EQ.0,  EXECUTION,            / 4X,
07490         X   20H   EQ.1,  DATA CHECK,           / 4X,
07500         X   19H NUMBER OF SUBSPACE,            / 4X,
07510         X   27H ITERATION VECTORS (NAD)  =, I5 / 4X,
07520         X   27H EQUATIONS PER BLOCK      =, I5 / 4X,
07530         X   27H TAPE10 SAVE FLAG (N10SV) =, I5 / 4X,
07540         X   27H GRAVITATIONAL CONSTANT   =, G12.5)
07550      210 FORMAT (5X,'TOTAL BLANK COMMON (MTOT)=',I5)
07560      300 FORMAT (// 48H ** ERROR.  (AT LEAST ONE LOAD CASE IS REQUIRED)   )
07570      310 FORMAT (// 33H ** ERROR.  ANALYSIS CODE (NDYN =,I3,9H) IS BAD.   )
07580      350 FORMAT (//,45X,'USC VERSION  JULY 4, 1976')
07590      360 FORMAT ('0GEOMETRIC STIFFNESS OPTION IS BEING USED')
07600      370 FORMAT ('0BANDWIDTH MINIMIZATION IS REQUESTED')
07610      380 FORMAT ('0STRUCTURE PLOTTING IS REQUESTED')
07620      390 FORMAT('0RESTART OF STRUCTURE PLOTTING REQUESTED')
07630     2000 FORMAT ('1',/,
07640         X15X,' SSSSSSSSSS     AAAAAAAAAA     PPPPPPPPPPP ',17X,
07650         X    '     VV            VV',/,
07660         X15X,'SSSSSSSSSSSSS    AAAAAAAAAAAA   PPPPPPPPPPPP',17X,
07670         X    '     VV            VV',/,
07680         X15X,'SS          SS   AA          AA   PP         PP',17X,
07690         X    '       VV        VV ',/,
07700         X15X,'SS               AA          AA   PP         PP',17X,
07710         X    '       VV        VV ',/,
07720         X15X,'SSS              AA          AA   PP         PP',17X,
07730         X    '         VV    VV   ',/,
07740         X15X,' SSSSSSSSS.      AAAAAAAAAAAA   PPPPPPPPPPPP',17X,
07750         X    '         VV    VV   ')
07760     2001 FORMAT (
07770         X15X,'   SSSSSSSSS     AAAAAAAAAAAA   PPPPPPPPPPP ',17X,
07780         X    '           VV  VV   ',/,
07790         X15X,'             SSS   AA          AA   PP              ',17X,
07800         X    '           VV  VV   ',/,
07810         X15X,'              SS   AA          AA   PP              ',17X,
07820         X    '            VVVV    ',/,
07830         X15X,'SS            SS   AA          AA   PP              ',17X,
07840         X    '            VVVV    ',/,
07850         X15X,'SSSSSSSSSSSSS    AA          AA   PP              ',17X,
07860         X    '             VV     ',/,
07870         X15X,' SSSSSSSSSSS     AA          AA   PP              ',17X,
07880         X    '             VV     ')
07890     2020 FORMAT (//,48X,5A4   )
07900          END

COMMON BLOCKS

/GAR/(+47036)
A       +0
/JUNK/(+642)
HED     +0        JUK      +22

/ELPAR/(+30)
NPAR    +3        NUMNP    +16      MBAND    +17      NELTYP   +20      N1       +21
N2      +22       N3       +23      N4       +24      N5       +25      MTOT     +26
NEQ     +27
```

```
HEDPRT   LASHEL.FOR       FORTRAN V.5A(621) /KI    23-MAY-78        12:38   PAGE 1-3

/EM/(+12022)
QQQ      +0
/DYN/(+20)
IDUS     +0         NDYN      +13       THDPCH   +14      THSPCH   +16

/TAPES/(+6)
NQG      +0
/EXTRA/(+36)
MODEX    +0         NT8       +1        N10SV    +2       NT10     +3       KEQB     +4
NUMEL    +5         T         +6        S        +22

/SOL/(+13)
NBLOCK   +0         NEQB      +1        LL       +2       NF       +3       IDUM     +4
NEIG     +5         NAD       +6        NVV      +7       ANORM    +10      NFQ      +12

/CTL/(+14)
GRAV     +0         ELPRT     +2        ELPCH    +3       GENPRT   +4       GENPCH   +5
DEFPCH   +6         IWTCG     +7        MINBND   +10      IPLT     +11      NPLOTS   +12
NPLT     +13
/GEOSTF/(+2)
GEOST    +0         NELGEO    +1

/SEIS/(+6)
NRSC     +0         KAPG      +1        NRS      +2       IIDUM    +3       DDATE    +4

/FORMAT/(+1)
NA       +0
/DAYTIM/(+5)
DAYTM    +0

SUBPROGRAMS CALLED

IABS.    DATE     SNGL.

SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

 SGRAV   1         IPRT    2        *KDYN    7

TEMPORARIES

 .A0016 632

HEDPRT  [ NO ERRORS DETECTED ]
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
INL       LASHEL.FOR       FORTRAN V.5A(621) /KI    23-MAY-78        12:38  PAGE 1

      SUBROUTINE INL(ID,B,TMASS,NUMNP,NEQB,NSB,LL,NBLOCK)
      IMPLICIT REAL*8(A-H,O-Z)
C
C     CALLED BY MAIN
C
C     INPUT NODAL LOADS (STATIC SOLUTION) OR NODAL MASSES (DYNAMIC)
C
      DIMENSION ID(NUMNP,6),B(NSB,LL),TMASS(NSB)
      COMMON /UNILOD/ FFX(999),FFY(999),FFZ(999)
      COMMON /JUNK/ R(6)
      COMMON /EXTRA/ MODEX
      COMMON/CTL/GRAV
C
C     READ THE ID ARRAY FROM FILE 8
C
      IF (MODEX .EQ. 1) GO TO 105
      REWIND 8
      READ (8) ID
C
C     ZERO THE MATRICES
C
      DO 100 N=1,NSB
      TMASS(N)=0.0D0
      DO 100 K=1,LL
  100 B(N,K)=0.0D0
C
C     READ THE CARDS (TERMINATE WHEN THE NODE NUMBER=0)
C
  105 WRITE (6,2000)
  110 READ (5,1000) N
      L=1
      R(1)=FFX(N)
      R(2)=FFY(N)
      R(3)=FFZ(N)
      R(4)=0.D0
      R(5)=0.D0
      R(6)=0.D0
      IF (N .LE. 0) GO TO 140
      IF(L.GT.0)GO TO 118
      DO 115 I=1,6
  115 IF(R(I).LT.0.0D0)R(I)=-R(I)/GRAV
      IF(R(2).EQ.0.0D0)R(2)=R(1)
      IF(R(3).EQ.0.0D0)R(3)=R(1)
  118 CONTINUE
      WRITE (6,2010) N,L,R
      IF (L .GT. LL) GO TO 200
      IF (N .GT. NUMNP) GO TO 210
      IF (MODEX .EQ. 1) GO TO 110
      DO 130 I=1,6
      IEQ=ID(N,I)
      IF (IEQ .LE. 0) GO TO 130
      IF (L .LE. 0) GO TO 120
      B(IEQ,L)=R(I)
      GO TO 130
  120 TMASS(IEQ)=R(I)
  130 CONTINUE
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
08390            GO TO 110
08400      C
08410      C     WRITE THE LOAD AND MASS MATRICES ON FILE 3
08420      C
08430        140 IF (MODEX .EQ. 1) RETURN
08440            REWIND 3
08450            DO 150 NB=1,NBLOCK
08460            N1=NEQB*(NB-1)+1
08470            N2=NEQB*NB
08480            WRITE (3) ((B(N,L),N=N1,N2),L=1,LL),(TMASS(N),N=N1,N2)
08490        150 CONTINUE
08500            RETURN
08510      C
08520      C     ERROR HANDLING
08530      C
08540        200 WRITE (6,3000) L,LL
08550            MODEX=1
08560            GO TO 110
08570        210 WRITE (6,3010) N,NUMNP
08580            MODEX=1
08590            GO TO 110
08600      C
08610       1000 FORMAT (I3)
08620       2000 FORMAT ('1N O D A L   L O A D S   (S T A T I C)   O R   ',
08630           X'M A S S E S   (D Y N A M I C)',///,
08640           X3X,'NODE',3X,'LOAD',
08650           X2(9X,'X-AXIS',9X,'Y-AXIS',9X,'Z-AXIS'),/,' NUMBER',3X,'CASE',
08660           X3(10X,'FORCE'),3(9X,'MOMENT'),/,1X)
08670       2010 FORMAT (2(3X,I4),1P6E15.5)
08680       3000 FORMAT ('0***FATAL ERROR*** LOAD NUMBER',I10,' IS GREATER',
08690           X' THAN THE MAXIMUM,',I10,/,' CONTINUE IN DATA CHECK MODE')
08700       3010 FORMAT ('0***FATAL ERROR*** NODE NUMBER',I10,' IS GREATER',
08710           X' THAN THE MAXIMUM NUMBER OF NODES,',I10,' CONTINUE IN DATA',
08720           X' CHECK MODE')
08730            END

COMMON BLOCKS

/UNILOD/(+13552)
FFX      +0         FFY       +3716   FFZ       +7634

/JUNK/(+14)
R        +0
/EXTRA/(+1)
MODEX    +0
/CTL/(+2)
GRAV     +0

SUBPROGRAMS CALLED
```

```
IML     LASHEL.FOR      FORTRAN V.5A(621) /KI    23-MAY-78        12:38   PAGE 1-2


SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*LL      1        *NEQB    2        *NB      3        *N1      4        *NBLOCK 5
*N       6        *K       7        *NUMNP  10         B      11         ID     12
 .S0007 13         .S0006 14         .S0005 15         .S0004 16        *NSB    17
 .S0003 20         .S0002 21         .S0001 22         .S0000 23         .I0007 24
 .I0006 25         .I0005 26         .I0004 27         .I0003 30        *L      31
 .I0002 32         .I0001 33        *I      34         .I0000 35         THASS  36
*IEQ    37        *N2     40

TEMPORARIES

 .A0016 177

IML      [ NO ERRORS DETECTED ]
```

```
      SUBROUTINE INPUTJ (ID,X,Y,Z,T)
      IMPLICIT REAL*8(A-H,O-Z)
C     CALLED BY MAIN
      COMMON /EXTRA/ MODEX,NT8,IFILL(14)
      COMMON /ELPAR/ NPAR(14),NUMNP,MBAND,NELTYP,N1,N2,N3,N4,N5,MTOT,NEQ
      DIMENSION X(NUMNP),Y(NUMNP),Z(NUMNP),ID(NUMNP,6),T(NUMNP),IPRC(5),
     X                H(9),A(9),C11(9),C12(9),C13(9),C21(9),C22(9),C23(9),C31(
     X                9),C32(9),C33(9),B44(9),B45(9),B54(9),B55(9),E11(9),E12(
     X  9),E13(9),E21(9),E22(9),E23(9),E31(9),E32(9),E33(9),G44(9),G45(9
     X                ),G54(9),G55(9),HS(9),RA(5,5),RB(5,5),RC(5,5),EE(5,5),
     X                C(5,5)
C
C
C---- SPECIAL NODE CARD FLAGS
C
C     IT     =    COORDINATE SYSTEM TYPE  (CC 1, ANY NODE CARD)
C                 EQ. , CARTESIAN
C                 EQ.C, CYLINDRICAL WITH GENERATION IN CARTESIAN
C                 EQ.D, CYLINDRICAL WITH GENERATION IN CYLINDRICAL
C
C     IPR    =    PRINT SUPPRESSION FLAG  (CC 6, CARD FOR NODE 1 ONLY)
C                 EQ. , NORMAL PRINTING
C                 EQ.A, SUPPRESS SECOND PRINTING OF NODAL ARRAY DATA
C                 EQ.B, SUPPRESS PRINTING OF ID-ARRAY
C                 EQ.C, BOTH *A* AND *B*
C
C
      DATA IPRC/1H ,1HA,1HB,1HC,1HD/
C
      IPR = IPRC(I)
      NUME=NPAR(2)
      NUML=NPAR(3)
      NUMFX=NPAR(4)
C     READ THICKNESS AND ELASTIC PROPERTIES OF THE LAYERS, THEN DO THE
C     TRANSFORMATION
C
      WRITE(6,5)
      DO 100 L=1,NUML
      READ(5,6) A(L),H(L),C11(L),C12(L),C13(L),C22(L),C23(L),C33(L),
     X          B44(L),B45(L),B55(L)
      C21(L)=C12(L)
      C31(L)=C13(L)
      C32(L)=C23(L)
      B54(L)=B45(L)
C
      DO 95 I=1,5
      DO 95 J=1,5
      RA(I,J)=0.D0
      RB(I,J)=0.D0
      RC(I,J)=0.D0
      C(I,J)=0.D0
   95 EE(I,J)=0.D0
      C(1,1)=C11(L)
      C(1,2)=C12(L)
      C(1,3)=C13(L)
      C(2,1)=C21(L)
```

```
09300           C(2,2)=C22(L)
09310           C(2,3)=C23(L)
09320           C(3,1)=C31(L)
09330           C(3,2)=C32(L)
09340           C(3,3)=C33(L)
09350           C(4,4)=B44(L)
09360           C(4,5)=B45(L)
09370           C(5,4)=B54(L)
09380           C(5,5)=B55(L)
09390           RA(1,1)=DCOS(A(L))**2
09400           RA(1,2)=DSIN(A(L))*DSIN(A(L))
09410           RA(1,3)=-DSIN(2.*A(L))
09420           RA(2,1)=RA(1,2)
09430           RA(2,2)=RA(1,1)
09440           RA(2,3)=-RA(1,3)
09450           RA(3,1)=RA(2,3)/2.
09460           RA(3,2)=RA(1,3)/2.
```

```
09480           RA(3,3)=DCOS(2.*A(L))
      RA(4,4)=DCOS(A(L))
      RA(4,5)=DSIN(A(L))
      RA(5,4)=-RA(4,5)
      RA(5,5)=RA(4,4)
      DO 96 I=1,5
      DO 96 J=1,5
      DO 96 K=1,5
   96 RC(I,J)=RC(I,J)+RA(I,K)*C(K,J)
      RB(1,1)=RA(1,1)
      RB(1,2)=RA(1,2)
      RB(1,3)=-RA(1,3)/2.
      RB(2,1)=RA(1,2)
      RB(2,2)=RA(1,1)
      RB(2,3)=RA(1,3)/2.
      RB(3,1)=RA(1,3)
      RB(3,2)=-RA(1,3)
      RB(3,3)=RA(3,3)
      RB(4,4)=RA(4,4)
      RB(4,5)=-RA(4,5)
      RB(5,4)=RA(4,5)
      RB(5,5)=RA(4,4)
      DO 97 I=1,5
      DO 97 J=1,5
      DO 97 K=1,5
   97 EE(I,J)=EE(I,J)+RC(I,K)*RB(K,J)
      E11(L)=EE(1,1)
      E12(L)=EE(1,2)
      E13(L)=EE(1,3)
      E21(L)=EE(2,1)
      E22(L)=EE(2,2)
      E23(L)=EE(2,3)
      E31(L)=EE(3,1)
      E32(L)=EE(3,2)
      E33(L)=EE(3,3)
      G44(L)=EE(4,4)
      G45(L)=EE(4,5)
      G54(L)=EE(5,4)
      G55(L)=EE(5,5)
  100 WRITE(6,7)L,H(L),E11(L),E12(L),E13(L),E21(L),E22(L),E23(L),E31(L),
     1E32(L),E33(L),G44(L),G45(L),G54(L),G55(L)
      HS(1)=H(1)
      NUML1=NUML+1
      IF (NUML .EQ. 1) GO TO 111
      DO 101 L=2,NUML
      L1=L-1
  101 HS(L)=HS(L1)+H(L)
  111 REWIND 15
      WRITE(15) ((H(L),HS(L),E11(L),E12(L),E13(L),E21(L),E22(L),E23(
     X          L),E31(L),E32(L),E33(L),G44(L),G45(L),G54(L),G55(L)),L=1,
     X              NUML)
C
C     READ THE NODAL COORDINATES ON 1ST LAYER AND THEN GENERATE THE
C     POINTS ON THE TOP OF 1ST LAYER
C
      DO 200 N=1,NUMNP
```

```
              T(N)=0.D0
        200   READ (5,300) I,X(I),Y(I),Z(I)
        300   FORMAT(I3,3F7.4)
       C
       C      READ NODAL POINTS DEGREE OF FREEDOM ID BY ASSUMING THEY ARE FREE
       C
              DO 104 I=1,NUMNP
              DO 104 J=1,6
        104   ID(I,J)=0
       C
       C      READ ANY FIXED NODE NUMBER AND DIRECTION
       C
              IF (NUMFX .EQ. 0) GO TO 108
              DO 105 I=1,NUMFX
        105   READ (5,106) N,(ID(N,J),J=1,3)
        108   WRITE (6,2000)
              WRITE (6,2003)
              WRITE (6,2001)
       C
              DO 107 N=1,NUMNP
        107   WRITE(6,2002) N,(ID(N,I),I=1,6),X(N),Y(N),Z(N)
       C
       C      GENERATE THE NUMBER OF EQUATION AND REDEFINE ID
       C      FOR A SINGLE LAYER PROBLEM
       C      FOR MULTI-LAYER THE PROGRAM SHOULD BE CHANGED
       C
              NEQ=0
              NUMN1=NUMNP-1
              DO 60 N=1,NUMN1,2
              N1=N+1
              DO 61 J=1,2
              IF(ID(N,J)-1) 62,63,61
         62   NEQ=NEQ+1
              ID(N,J)=NEQ
              GO TO 61
         63   ID(N,J)=0
         61   CONTINUE
              DO 64 J=1,2
              IF(ID(N1,J)-1) 65,66,64
         65   NEQ=NEQ+1
              ID(N1,J)=NEQ
              GO TO 64
         66   ID(N1,J)=0
         64   CONTINUE
              IF(ID(N,3)-1) 67,68,60
         67   NEQ=NEQ+1
              ID(N,3)=NEQ
              ID(N1,3)=NEQ
              GO TO 60
         68   ID(N,3)=0
              ID(N1,3)=0
         60   CONTINUE
       C
       C      PRINT MASTER INDEX ARRAY
       C
              IF (IPR .EQ. IPRC(3) .OR.IPR .EQ. IPRC(4)) GO TO 75
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
          WRITE (6,2004)  (N,(ID(N,I),I=1,6),N=1,NUMNP)
     75   CONTINUE
          IF(MODEX.EQ.0) GO TO 74
C***      DATA PORTHOLE SAVE
          WRITE (NT8) ((ID(N,I),I=1,6),N=1,NUMNP)
          WRITE (NT8) (X(N),N=1,NUMNP)
          WRITE(NT8) (Y(N),N=1,NUMNP)
          WRITE (NT8) (Z(N),N=1,NUMNP)
          WRITE (NT8) (T(N),N=1,NUMNP)
          ENDFILE NT8
C
          REWIND 2
          WRITE (2) ID
C
          RETURN
C
      74 CONTINUE
          REWIND 8
          WRITE (8) ID
C
          RETURN
C
     5    FORMAT(//19H1ELASTIC PROPERTIES)
     6    FORMAT(F5.1,F3.1,9F8.0)
     7    FORMAT(I5,1X,F4.1,2X,13F9.0)
     106  FORMAT(I5,3I1)
    1000  FORMAT(A1,I5,A1,F10.1,F10.3,F10.1,I5,F10.1)
    2000  FORMAT (//23H1NODAL POINT INPUT DATA )
    2001  FORMAT (5H0NODE 3X 24HBOUNDARY CONDITION CODES 11X
         X  23HNODAL POINT COORDINATES / 7H NUMBER 2X 1HX 4X 1HY 4X 1HZ 3X
         X 2HXX 3X 2HYY 3X 2HZZ12X 1HX 12X 1HY 12X 1HZ 12X 1HT )
    2002  FORMAT(I5,6I5,3F13.5)
    2003  FORMAT (//21H GENERATED NODAL DATA)
    2004  FORMAT (//17H1EQUATION NUMBERS/
         X 35H    N    X    Y    Z   XX   YY   ZZ /(7I5))
          END

COMMON BLOCKS

/EXTRA/(+20)
MODEX    +0       NT8      +1       IFILL    +2

/ELPAR/(+30)
NPAR     +0       NUMNP    +16      MBAND    +17      NELTYP   +20      N1       +21
N2       +22      N3       +23      N4       +24      N5       +25      MTOT     +26
NEQ      +27

SUBPROGRAMS CALLED

DCOS.    DSIN.
```

```
INPUTJ  LASHEL.FOR       FORTRAN V.5A(621) /KI   23-MAY-78        12:38   PAGE 2-3


SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

 .S0020 1         C23     2         .I0012 24         .I0011 25         .I0010 26
 E22    27        Z       51        *NUMN1  52        B54    53         T      75
 .S0034 76        *N      77        E33    100        .S0033 122        HS     123
 .S0032 145       *K      146       .S0031 147        C13    150        .S0030 172
 H      173       E12     215       *IPR   237        B44    240        C31    262
 E23    304       *NUML1  326       B55    327        G54    351        Y      373
 C21    374       ID      416       E13    417        *J     441        .S0007 442
 .S0006 443       B45     444       C32    466        .S0005 510        G44    511
 .S0004 533       RC      534       .S0003 616        E31    617        A      641
 .S0002 663       *NUML   664       .S0001 665        .S0000 666        C11    667
*NUME   711       EE      712       G55    774        .S0017 1016       C22    1017
 X      1041      .S0016 1042       .S0015 1043       RB     1044       .S0014 1126
 .I0007 1127      E21     1130      .S0013 1152       .I0006 1153       .S0012 1154
 .I0005 1155      .S0011 1156       .I0004 1157       *L1    1160       .S0010 1161
 .I0003 1162      *L      1163      .I0002 1164       C33    1165       .I0001 1207
 G45    1210      *I      1232      .I0000 1233       E32    1234       *NUMFX 1256
 C      1257      C12     1341      .S0027 1363       .S0026 1364       RA     1365
 .S0025 1447      E11     1450      .S0024 1472       IPRC   1473       .S0023 1500
 .S0022 1501      .S0021 1502

TEMPORARIES

 .A0016 1626      .Q0000 1627       .Q0001 1630

INPUTJ  [ NO ERRORS DETECTED ]
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      SUBROUTINE LAYSHL
      IMPLICIT REAL*8(A-H,O-Z)
C
C     CALLS AYSHL,STRSC
C     CALLED BY ELTYPE
C
      COMMON /GAR/ A(9999)
      COMMON /ELPAR/ NPAR(14),NUMNP,MBAND,NELTYP,N1,N2,N3,N4,N5,MTOT,NEQ
      COMMON /JUNK/  LT,LH,L,IPAD,SIG(20),N6,N7,N8,N9,N10
      COMMON /EXTRA/ MODEX,NT8,N10SV,NT10
C
      N1=1
      IF(NPAR(1).EQ.0) GO TO 500
      N2=N1+6*NUMNP
      N3=N2+NUMNP
      N4=N3+NUMNP
      N5=N4+NUMNP
      N6=N5+NUMNP
      N7 =N6+NPAR(3)
      N8 =N7+NPAR(3)
      N9 =N8+NPAR(3)
      N10=N9+NPAR(3)
      MM=N10+NPAR(3)
      CALL  ERROR(MM)
C
      CALL AYSHL(A(N1),A(N2),A(N3),A(N4),NUMNP)
C
      RETURN
C
  500 WRITE (6,2002)
      NUME=NPAR(2)
      DO 800 MM=1,NUME
      CALL  STRSC (A(N1),A(N3),NEQ,0)
      WRITE (6,2001)
      DO 800 L=LT,LH
      CALL  STRSC (A(N1),A(N3),NEQ,1)
      WRITE (6,3002) MM,L,SIG(1),SIG(2),SIG(3),SIG(4),SIG(5),SIG(6),
     X                 SIG(7),SIG(8),SIG(9)
C***  STRESS PORTHOLE
      IF(N10SV.EQ.1)
     XWRITE (NT10) MM,L,SIG(1),SIG(2),SIG(3),SIG(4),SIG(5),SIG(6),
     X                 SIG(7),SIG(8),SIG(9)
  800 CONTINUE
      RETURN
C
 2001 FORMAT (/)
 2002 FORMAT ('1S H E L L   E L E M E N T   S T R E S S E S',//,
     X  '  ELEMENT    LOAD    FXX1         FXX2         FYY1         FYY2',
     X  '        FXY1         FXY2         FYZ1         FYZ2         FXZ')
 3002 FORMAT (2I8,9F12.5)
      END

COMMON BLOCKS

/GAR/(+47036)
```

```
LAYSHL  LASHEL.FOR       FORTRAN V.5A(621) /KI   23-MAY-78        12:38   PAGE 1-1


A         +0
/ELPAR/(+30)
NPAR      +0       NUMNP    +16      MBAND    +17      NELTYP   +20      N1       +21
N2        +22      N3       +23      N4       +24      N5       +25      MTOT     +26
NEG       +27
/JUNK/(+61)
LT        +0       LM       +1       L        +2       IPAD     +3       SIG      +4
N6        +54      N7       +55      N8       +56      N9       +57      N10      +60

/EXTRA/(+4)
MODEX     +0       NT8      +1       N10SV    +2       NT10     +3

SUBPROGRAMS CALLED

AYSHL   ERROR   STRSC

SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*MM       1        .S0001 2          .S0000 3          *NUME    4

TEMPORARIES

 .A0016 55         .Q0000 56         .Q0001 57         .Q0002 60         .Q0003 61

LAYSHL  [ NO ERRORS DETECTED ]
```

```
      SUBROUTINE AYSHL(ID,X,Y,Z,NUMNP)
      IMPLICIT REAL*8(A-H,O-Z)
      LOGICAL ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH
C
C     CALLS   CALBAN
C     CALLED BY LAYSHL
C
C
      DIMENSION X(NUMNP),Y(NUMNP),Z(NUMNP),ID(NUMNP,6),
     X           QX(999),QY(999),QZ(999),FZ(999),E11(9),E12(9),
     X           E22(9),E23(9),E31(9),E32(9),E33(9),G44(9),G45(9),G54(9),
     X           E13(9),E21(9),G55(9),T(100),H(9),HS(9)
      COMMON /UNILOD/FFX(999),FFY(999),FFZ(999)
      COMMON /ELPAR/ NPAR(14),NNNNN,MBAND,NELTYP,N1,N2,N3,N4,N5,MTOT,NEQ
      COMMON /EM/LM(24),ND,NS,S(24,24),P(24,4),XM(24),ST(12,24),TT(12,4)
      COMMON /JUNK/EMUL(4,4),I1,J1,K1,I2,J2,K2,L,M,N,I,J,K,X2,X1,Y2,Y1,
     X              DX,DY,DXY,DYX,DX2,MCD,R1,R2,R3,R4,R5,R6,R7,R8,R9,R10,
     X              MIN,MAX,NDIF,MTYP,MTYPE,R,L11,M1,T1,T2,T3,T4,T5,T6
      COMMON /EXTRA/ MODEX,NT8
      COMMON /CTL/ GRAV,ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH,
     1  IWICG,MINBND,IPLT
C
      N2=N1+6*NUMNP
      N3=N2+NUMNP
      N4=N3+NUMNP
      N5=N4+NUMNP
C
C     CONTROL INFORMATION AND MEMBER DATA
C
      MTYPE=NPAR(1)
      IF (MTYPE .EQ. 14) GO TO 2001
      READ (5,2002) R
 2002 FORMAT(F13.3)
 2001 NUME=NPAR(2)
      NUML=NPAR(3)
      WRITE (6,2000) NUME,NUML,R
C
C     READ THE THICKNESS AND ELASTIC PROPERTIES FROM TAPE 15
C
      REWIND 15
      READ(15)((H(L),HS(L),E11(L),E12(L),E13(L),E21(L),E22(L),E23(L),
     A           E31(L),E32(L),E33(L),G44(L),G45(L),G54(L),G55(L)),L=1,
     X           NUML)
C***  DATA PORTHOLE SAVE
      IF(MODEX.EQ.1)
     XWRITE(NT8)((H(L),HS(L),E11(L),E12(L),E13(L),E21(L),E22(L),E23
     X            (L),E31(L),E32(L),E33(L),G44(L),G45(L),G54(L),G55(L)
     X            ),L=1,NUML)
C
C     ELEMENT LOAD MULTIPLIERS
C
      READ (5,1003) EMUL
      WRITE (6,2003) EMUL
C***  DATA PORTHOLE SAVE
      IF(MODEX.EQ.1)
     XWRITE (NT8) EMUL
```

```
C
      WRITE (6,2005)
C
C     ELEMENT AND LOAD INFORMATION
C
      DO 500 I=1,NUMNP
      FFX(I)=0.D0
      FFY(I)=0.D0
  500 FFZ(I)=0.D0
  100 READ (5,1005) M,I1,J1,K1,L,MCD,ML
      IF (ML .EQ. 0) GO TO 115
      READ (5,1006) QX(I1),QY(I1),QX(J1),QY(J1),QX(K1),QY(K1),
     X              QX(I2),QY(I2),QX(J2),QY(J2),QX(K2),QY(K2),
     X              QZ(I1),FZ(I1),QZ(J1),FZ(J2),QZ(K1),FZ(K1)
  115 GO TO (101,102,103,104), MCD
  101 X2=X(J1)
      X1=X(I1)
      Y2=Y(K1)
      Y1=Y(J1)
      JX=1
      JY=1
      JC=1
      GO TO 105
  102 X2=X(I1)
      X1=X(J1)
      Y2=Y(K1)
      Y1=Y(J1)
      JX=1
      JY=-1
      JC=-1
      GO TO 105
  103 X2=X(I1)
      X1=X(J1)
      Y2=Y(J1)
      Y1=Y(K1)
      JX=-1
      JY=-1
      JC=1
      GO TO 105
  104 X1=X(I1)
      X2=X(J1)
      Y2=Y(J1)
      Y1=Y(K1)
      JX=-1
      JY=1
      JC=-1
  105 I2=I1+1
      J2=J1+1
      K2=K1+1
      DX=X2-X1
      DY=Y2-Y1
      DXY=DX*DY
      DYX=DY/DX
      DX2=DX**2
      IF (MTYPE .EQ. 14) GO TO 160
      AR1=DABS(DX*DY*(R+H(L))/6.)
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
13871          AR2=DABS(DY*(R+H(L))/8.)
13872          GO TO 161
13875      160 AR1=DABS(DX*DY/8.)
13876          AR2=DABS(DY*H(L)/8.)
13877      161 AR3=DABS(DX*H(L)/8.)
13878          FFZ(I1)=FFZ(I1)+QZ(I1)*AR1
13880          FFX(I1)=FFX(I1)+QX(I1)*AR2
13881          FFY(I1)=FFY(I1)+QY(I1)*AR3
13882          FFZ(J1)=FFZ(J1)+QZ(J1)*AR1
13883          FFX(J1)=FFX(J1)+QX(J1)*AR2
13884          FFY(J1)=FFY(J1)+QY(J1)*AR3
13885          FFZ(K1)=FFZ(K1)+QZ(K1)*AR1
13886          FFX(K1)=FFZ(K1)+QX(K1)*AR2
13887          FFY(K1)=FFY(K1)+QY(K1)*AR3
13888          FFX(I2)=FFX(I2)+QX(I2)*AR2
13889          FFY(I2)=FFY(I2)+QY(I2)*AR3
13890          FFX(J2)=FFX(J2)+QX(J2)*AR2
13891          FFY(J2)=FFY(J2)+QY(J2)*AR3
13892          FFX(K2)=FFX(K2)+QX(K2)*AR2
13893          FFY(K2)=FFY(K2)+QY(K2)*AR3
13894          FFZ(I2)=FFZ(I1)
13895          FFZ(J2)=FFZ(J2)
13896          FFZ(K2)=FFZ(K2)
13903          IF (MTYPE .EQ. 13) GO TO 107
13904          R1=H(L)
13905          R2=1.
13906          R3=1./H(L)
13907          R4=H(L)
13908          R6=H(L)/3.
13909          R7=H(L)/6.
13910          R8=H(L)/3.
13911          R9=DY
13912          R10=DY
13913          T1=H(L)
13914          T2=H(L)/2.
13915          T3=H(L)/3.
13916          T4=T1-2.*T2+T3
13917          T5=T2-T3
13918          T6=T1-T2
13919          JP=0
13920          GO TO 119
13930     107  R5=(R+HS(L))/H(L)
13940          R9=DY*(R+HS(L))
13941          JP=1
13950          IF (L .EQ. 1) GO TO 106
13960          L1=L-1
13970          R1=(R+HS(L1))*H(L)+0.5*H(L)*H(L)
13980          R2=R+HS(L1)+H(L)/2.
13990          R3=(R+HS(L1))/H(L)+0.5
14000          R4=H(L)/(R+HS(L1))
14010          R6=(R+HS(L1))*H(L)/3.+H(L)*H(L)/4.
14020          R7=(R+HS(L1))*H(L)/6.+H(L)*H(L)/12.
14030          R8=(R+HS(L1))*H(L)/3.+H(L)*H(L)/12.
14040          R10=DY*(R+HS(L1))
14050          GO TO 103
14060      106 R1=R*H(L)+0.5*H(L)*H(L)
```

```
      R2=R+H(L)/2.
      R3=R/H(L)+0.5
      R4=H(L)/R
      R6=R*H(L)/3.+H(L)*H(L)/4.
      R7=R*H(L)/6.+H(L)*H(L)/12.
      R8=R*H(L)/3.+H(L)*H(L)/12.
      R10=DY*R
  109 T1=DLOG(1.0+R4)
      T2=1.0-1.0/R4*DLOG(1.0+R4)
      T3=0.5-1.0/R4+(DLOG(1.0+R4))/R4/R4
      T4=T1-2.0*T2+T3
      T5=T2-T3
      T6=T1-T2
C
C     1. FORM STIFFNESS AND STRESS MATRICES
C
  115 S( 1, 1)=DYX*(G44(L)*R3*DX2/12.+E11(L)*R6/2.)
      S( 1, 2)=DYX*((G45(L)+G54(L))*R5*DX2/24.+(E13(L)+E31(L))*R8/4.)
      S( 1, 3)=DYX/2.*(G44(L)*R3*DX2/12.-E11(L)*R8)+(E13(L)+E31(L))/12.
     X        *H(L)*JC
      S( 1, 4)=DYX/4.*((G45(L)+G54(L))*R5*DX2/12.-(E13(L)+E31(L))*R8)+(E
     X        12(L)+E21(L))*H(L)/12.*JC
      S( 1, 5)=DYX*G44(L)*R3*DX2/24.-(E13(L)+E31(L))*H(L)/12.*JC
      S( 1, 6)=DYX*(G45(L)+G54(L))*R5*DX2/48.-(E12(L)+E21(L))*H(L)/12.
     X        *JC
      S( 1, 7)=DYX/2.*(-G44(L)*R3*DX2/6.+E11(L)*R7)
      S( 1, 8)=DYX*(-(G45(L)+G54(L))/R4*DX2/24.+(E13(L)+E31(L))*R7/4.)
      S( 1, 9)=DYX/2.*(-G44(L)*R2*DX2/12.-E11(L)*R7)+(E13(L)+E31(L))*
     X        H(L)/24.*JC
      S( 1,10)=DYX*(-(G45(L)+G54(L))/R4*DX2/48.-(E13(L)+E31(L))/4.*R7)
     X        +(E12(L)+E21(L))*H(L)*JC/24.
      S( 1,11)=-DXY*G44(L)*R3/24.-(E13(L)+E31(L))*H(L)/24.*JC
      S( 1,12)=-DXY*(G45(L)+G54(L))/R4/48.-(E12(L)+E21(L))*JC*H(L)/24.
      S( 1,13)=DY*JY/12.*(G44(L)*R2-JP*(E12(L)+E21(L))*H(L)/4.)
      S( 1,14)=(DX*JX*(G45(L)+G54(L))-DY*JY*2.*G44(L)*R2-(E12(L)+E21(L))
     X        *JP*H(L)*DY*JY/2.)/24.
      S( 1,15)=-JP*DY*JY*(E12(L)+E21(L))*H(L)/48.-DX*(G45(L)+G54(L))/24.
     X        *JX
      S(1,16)=S(1,13)
      S(1,17)=S(1,14)
      S(1,18)=S(1,15)
      S( 2, 2)=DYX*(G55(L)*T1*R5*R5*DX2/12.+E33(L)*R8/2.)
      S( 2, 3)=DYX*((G45(L)+G54(L))*R5*DX2/48.-(E13(L)+E31(L))*R8/4.)+E3
     X        3(L)*H(L)/6.*JC

      S( 2, 4)=DYX/2.*(G55(L)*R5*R5*T1*DX2/12.-E33(L)*R8)+(E23(L)+E32(L)
     X        )*H(L)/12.*JC
      S( 2, 5)=DYX*(G45(L)+G54(L))*R5*DX2/48.-E33(L)*H(L)/6.*JC
      S( 2, 6)=DXY*G55(L)*R5*R5*T1/24.-(E23(L)+E32(L))*H(L)/12.*JC
      S( 2, 7)=DYX*(-(G45(L)+G54(L))*R5*DX2/24.+(E13(L)+E31(L))*R7/4.)
      S( 2, 8)=DYX/2.*(-G55(L)*R5*T1/R4*DX2/6.+E33(L)*R7)
      S( 2, 9)=DYX/4.*(-(G45(L)+G54(L))*R5*DX2/12.-(E13(L)+E31(L))*R7)+
     X        E33(L)*H(L)/12.*JC
      S( 2,10)=DYX/2.*(-G55(L)*R5*T1/R4*DX2/12.-E33(L)*R7)+(E23(L)
     X        +E32(L))*H(L)/24.*JC
      S( 2,11)=-DXY*(G45(L)+G54(L))*R5/48.-E33(L)*H(L)/12.*JC
```

```
14740          S( 2,12)=-DXY*G55(L)*R5*T1/R4/24.-(E23(L)+E32(L))*H(L)/24.*JC
14750          S( 2,13)=DY*JY/24.*((G45(L)+G54(L))*R5-(E23(L)+E32(L))/2.)*H(L)
14751         X         *JP
14760          S( 2,14)=-DY*JY*((G45(L)+G54(L))*R5/24.+(E23(L)+E32(L))/48.)*H(L)
14770         X         *JP+DX*JX*G55(L)*T1*R5/12.
14780          S( 2,15)=-DX*JX*G55(L)*T1*R5/12.-DY*JY*(E23(L)+E32(L))*H(L)/48.
14781         X         *JP
14790          S(2,16)=S(2,13)
14800          S(2,17)=S(2,14)
14810          S(2,18)=S(2,15)
14820          S( 3, 3)=DYX*(G44(L)*R3*DX2/12.+E11(L)*R8/2.)-(E13(L)+E31(L))*H(L)
14830         X         /6.*JC+E33(L)*T4/DYX/2.
14840          S( 3, 4)=DYX/4.*((G45(L)+G54(L))*R5*DX2/6.+(E13(L)+E31(L))*R8)-(E
14850         X         12(L)+E21(L)+2.*E33(L))*H(L)/12.*JC+(E23(L)+E32(L))
14860         X         *T4/DYX/4.
14870          S( 3, 5)=DXY*G44(L)*R3/24.+(E13(L)+E31(L))*H(L)/12.*JC-E33(L)*T4/
14880         X         DYX/2.
14890          S( 3, 6)=DXY*(G45(L)+G54(L))*R5/48.+(E12(L)+E21(L))*H(L)/12.*JC-(E
14900         X         23(L)+E32(L))*T4/DYX/4.
14910          S( 3, 7)=DYX/2.*(-G44(L)*R3*DX2/12.-E11(L)*R7)+(E13(L)+E31(L))
14920         X         *H(L)/24.*JC
14930          S( 3, 8)=DYX/4.*(-(G45(L)+G54(L))/R4*DX2/12.-(E13(L)+E31(L))*R7)+
14940         X         E33(L)*H(L)/12.*JC
14950          S( 3, 9)=DYX*(E11(L)*R7-G44(L)*R3*DX2/6.)/2.-(E13(L)+E31(L))*H(L)
14960         X         /12.*JC+E33(L)*T5/DYX/2.
14970          S( 3,10)=DYX*(-(G45(L)+G54(L))/R4*DX2/24.+(E13(L)+E31(L))*R7/4.)-
14980         X         (2.*E33(L)+E12(L)+E21(L))*H(L)*JC/24.+(E23(L)+E32(L))*T5/
14990         X         DYX/4.
15000          S( 3,11)=-DXY*G44(L)*R3/24.+(E13(L)+E31(L))*H(L)/24.*JC-E33(L)*T5
15010         X         /DYX/2.
15020          S( 3,12)=-DXY*(G45(L)+G54(L))/R4/48.+(E12(L)+E21(L))*H(L)*JC/24.
15030         X         -(E23(L)+E32(L))*T5/DYX/4.
15040          S( 3,13)=G44(L)*R2*DY*JY/12.+JP*(E12(L)+E21(L))*H(L)*DY*JY/48.-(
15050         X         E23(L)+E32(L))*JP*T6*DX*JX/24.
15060          S( 3,14)=DY*JY*(-2.*G44(L)*R2+JP*(E12(L)+E21(L))*H(L)/2.)/24.+DX
15070         X         *JX*(G45(L)+G54(L)-(E23(L)+E32(L))*JP*T6)/24.
15080          S( 3,15)=JP*DY*JY*(E12(L)+E21(L))*H(L)/48.+DX*JX*(-(G45(L)+G54(L)
15090         X         )-(E23(L)+E32(L))*JP*T6)/24.
15100          S(3,16)=S(3,13)
15110          S(3,17)=S(3,14)
15120          S(3,18)=S(3,15)
15130          S( 4, 4)=DYX*(G55(L)*R5*R5*T1*DX2/12.+E33(L)*R8/2.)-(E23(L)+E32(L)
15140         X         )*H(L)/6.*JC+E22(L)*T4/DYX/2.
15150          S( 4, 5)=DXY*(G45(L)+G54(L))*R5/48.+E33(L)*H(L)/6.*JC-(E23(L)+E32(
15160         X         L))*T4/DYX/4.
15170          S( 4, 6)=DXY*G55(L)*R5*R5*T1/24.+(E23(L)+E32(L))*H(L)/12.*JC-E22(L
15180         X         )*T4/DYX/2.
15190          S( 4, 7)=DYX/4.*(-(G45(L)+G54(L))*R5*DX2/12.-(E13(L)+E31(L))*R7)+(
15200         X         E12(L)+E21(L))*H(L)*JC/24.
15210          S( 4, 8)=DYX*(-G55(L)*R5*T1/R4*DX2/12.-E33(L)*R7)/2.+(E23(L)+E32(L
15220         X         ))*H(L)/24.*JC
15230          S( 4, 9)=DYX*(-(G45(L)+G54(L))*R5*DX2/24.+(E13(L)+E31(L))*R7/4.)-(
15240         X         2.*E33(L)+E12(L)+E21(L))*H(L)*JC/24.+(E23(L)+E32(L))*T5/
15250         X         DYX/4.
15260          S( 4,10)=DYX/2.*(-G55(L)*R5*T1/R4*DX2/6.+E33(L)*R7)-(E23(L)+E32(L)
15270         X         )*H(L)/12.*JC+E22(L)*T5/DYX/2.
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      S( 4,11)=-DXY*(G45(L)+G54(L))*R5/48.+E33(L)*H(L)/12.*JC-(E23(L)+
     X          E32(L))*T5/DYX/4.
      S( 4,12)=-DXY*G55(L)*R5*T1/R4/24.+(E23(L)+E32(L))*H(L)/24.*JC-E22(
     X          L)*T5/DYX/2.
      S( 4,13)=DY*JY*(G45(L)+G54(L))*R5*H(L)/24.+DY*JY*(E23(L)+E32(L))*H
     X          (L)*JP/48.-E22(L)*JP*JX*JX*T6/12.
      S( 4,14)=DY*JY/24.*(JP*(E23(L)+E32(L))/2.-(G45(L)+G54(L))*R5)*H(L)
     X          +DX*JX/12.*(G55(L)*T1*R5-JP*E22(L)*T6)
      S( 4,15)=DY*JP*JY*(E23(L)+E32(L))*H(L)/48.-DX*JX/12.*(JP*E22(L)*T6
     X          +G55(L)*T1*R5)
      S(4,16)=S(4,13)
      S(4,17)=S(4,14)
      S(4,18)=S(4,15)
      S( 5, 5)=DXY*G44(L)*R3/12.+E33(L)*T4/DYX/2.
      S( 5, 6)=DXY*(G45(L)+G54(L))*R5/24.+(E23(L)+E32(L))*T4/DYX/4.
      S( 5, 7)=-DXY*G44(L)*R3/24.-(E13(L)+E31(L))*H(L)/24.*JC
      S( 5, 8)=-DXY*(G45(L)+G54(L))/R4/48.-E33(L)*H(L)/12.*JC
      S( 5, 9)=-DXY*G44(L)*R3/24.+(E13(L)+E31(L))*H(L)/24.*JC-E33(L)*T5/
     X          DYX/2.
      S( 5,10)=-DXY*(G45(L)+G54(L))/R4/48.+E33(L)*H(L)/12.*JC-(E23(L)
     X          +E32(L))*T5/DYX/4.
      S( 5,11)=-DXY*G44(L)*R3/12.+E33(L)*T5/DYX/2.
      S( 5,12)=-DXY*(G45(L)+G54(L))/R4/24.+(E23(L)+E32(L))*T5/DYX/4.
      S( 5,13)=G44(L)*R2*DY*JY/12.+JP*(E23(L)+E32(L))*T6*DX*JX/24.
      S( 5,14)=-G44(L)*R2*DY*JY/12.+DX*JX/24.*(G45(L)+G54(L)+(E23(L)
     X          +E32(L))*JP*T6)
      S( 5,15)=-DX*JX/24.*(G45(L)+G54(L)-JP*(E23(L)+E32(L))*T6)
      S(5,16)=S(5,13)
      S(5,17)=S(5,14)
      S(5,18)=S(5,15)
      S( 6, 6)=DXY*G55(L)*R5*R5*T1/12.+E22(L)*T4/DYX/2.
      S( 6, 7)=-DXY*(G45(L)+G54(L))*R5/48.-(E12(L)+E21(L))*H(L)*JC/24.
      S( 6, 8)=-DXY*G55(L)*R5*T1/R4/24.-(E23(L)+E32(L))*H(L)/24.*JC
      S( 6, 9)=-DXY*(G45(L)+G54(L))*R5/48.-(E23(L)+E32(L))*T5/DYX/4.+
     X          (E12(L)+E21(L))*H(L)*JC/24.
      S( 6,10)=-DXY*G55(L)*R5*T1/R4/24.+(E23(L)+E32(L))*H(L)/24.*JC-E22(
     X          L)*T5/DYX/2.
      S( 6,11)=-DXY*(G45(L)+G54(L))*R5/24.+(E23(L)+E32(L))*T5/DYX/4.
      S( 6,12)=-DXY*G55(L)*R5*T1/R4/12.+E22(L)*T5/DYX/2.
      S( 6,13)=DY*JY*(G45(L)+G54(L))*R5*H(L)/24.+JP*E22(L)*T6*DX*JX/12.
      S( 6,14)=DX*JX/12.*(G55(L)*T1*R5+JP*E22(L)*T6)-DY*JY/24.*H(L)*
     X          (G45(L)+G54(L))*R5
      S( 6,15)=DX*JX/12.*(JP*E22(L)*T6-G55(L)*T1*R5)
      S(6,16)=S(6,13)
      S(6,17)=S(6,14)
      S(6,18)=S(6,15)
      S( 7, 7)=DXY*G44(L)*R3/12.+DYX*E11(L)*R6/2.
      S( 7, 8)=DXY*(G45(L)+G54(L))/R4/24.+DYX*(E13(L)+E31(L))*R6/4.
      S( 7, 9)=DXY*G44(L)*R3/24.-DYX*E11(L)*R6/2.+(E13(L)+E31(L))*H(L)/
     X          12.*JC
      S( 7,10)=DXY*(G45(L)+G54(L))/R4/48.-DYX*(E13(L)+E31(L))*R6/4.+(E
     X          12(L)+E21(L))*H(L)/12.*JC
      S( 7,11)=DXY*G44(L)*R3/24.-(E13(L)+E31(L))*H(L)/12.*JC
      S( 7,12)=DXY*(G45(L)+G54(L))/R4/48.-(E12(L)+E21(L))*H(L)/12.*JC
      S( 7,13)=DY*JY/24.*(-2.*G44(L)*R2-JP*(E12(L)+E21(L))*H(L)/2.+
        S( 7,14)=DY*JY/12.*(G44(L)*R2-JP*(E12(L)+E21(L))*H(L)/4.)-DX*JX*
       X            (G45(L)+G54(L))/24.
        S( 7,15)=DX*JX*(G45(L)+G54(L))/24.-DY*JY*(E12(L)+E21(L))*H(L)/48.
       X            *JP
        S(7,16)=S(7,13)
        S(7,17)=S(7,14)
        S(7,18)=S(7,15)
        S( 8, 8)=DYX*(G55(L)*T1/R4/R4*DX2/12.+E33(L)*R6/2.)
        S( 8, 9)=DYX/4.*((G45(L)+G54(L))/R4*DX2/12.-(E13(L)+E31(L))*R6)+
       X            E33(L)*H(L)/6.*JC
        S( 8,10)=DYX/2.*(G55(L)*T1/R4/R4*DX2/12.-E33(L)*R6)+(E23(L)+E32(L)
       X            )*H(L)/12.*JC
        S( 8,11)=DXY*(G45(L)+G54(L))/R4/48.-E33(L)*H(L)/6.*JC
        S( 8,12)=DXY*G55(L)*T1/R4/R4/24.-(E23(L)+E32(L))*H(L)/12.*JC
        S( 8,13)=-JP*DY*JY/24.*((E23(L)+E32(L))*H(L)/2.+(G45(L)+G54(L))/R4
       X            *H(L))
        S( 8,14)=DY*JY/24.*((G45(L)+G54(L))/R4-JP*(E23(L)+E32(L))/2.)
       X            *H(L)-DX*JX*G55(L)*T1/R4/12.
        S( 8,15)=DX*JX*G55(L)*T1/R4/12.-JP*DY*JY*(E23(L)+E32(L))*H(L)/48.
        S(8,16)=S(8,13)
        S(8,17)=S(8,14)
        S(8,18)=S(8,15)
        S( 9, 9)=DXY*G44(L)*R3/12.+DYX*E11(L)*R6/2.-(E13(L)+E31(L))*H(L)/6
       X            .*JC+E33(L)*T3/2./DYX
        S( 9,10)=DXY*(G45(L)+G54(L))/R4/24.+(E13(L)+E31(L))*R6*DYX/4.-(E12
       X            (L)+E21(L)+2.*E33(L))*H(L)/12.*JC+(E23(L)+E32(L))*T3/4./
       X            DYX
        S( 9,11)=DXY*G44(L)*R3/24.+(E13(L)+E31(L))*H(L)/12.*JC-E33(L)*T3
       X            /2./DYX
        S( 9,12)=DXY*(G45(L)+G54(L))/R4/48.+(E12(L)+E21(L))*H(L)/12.*JC
       X            -(E23(L)+E32(L))*T3/DYX/4.
        S( 9,13)=DY*JY/12.*(-G44(L)*R3+JP*(E12(L)+E21(L))/4.)*H(L)-DX*JX*(
       X            E23(L)+E32(L))*JP*T2/24.
        S( 9,14)=JP*DY*JY/48.*H(L)*(E12(L)+E21(L)+4.*G44(L)*R3)-DX*JX*
       X            (G45(L)+G54(L)+(E23(L)+E32(L))*JP*T2)/24.
        S( 9,15)=JP*DY*JY*H(L)*(E12(L)+E21(L))/48.+DX*JX*(G45(L)+G54(L)
       X            -JP*(E23(L)+E32(L))*T2)/24.
        S(9,16)=S(9,13)
        S(9,17)=S(9,14)
        S(9,18)=S(9,15)
        S(10,10)=DYX/2.*(G55(L)*T1/R4/R4*DX2/6.+E33(L)*R6)-(E23(L)+E32(L))
       X            *H(L)/6.*JC+E22(L)*T3/DYX/2.
        S(10,11)=DXY*(G45(L)+G54(L))/R4/48.+E33(L)*H(L)/6.*JC-(E23(L)+E32(
       X            L))*T3/DYX/4.
        S(10,12)=DXY*G55(L)*T1/R4/R4/24.+(E23(L)+E32(L))*H(L)/12.*JC-E22(L
       X            )/2./DYX*T3
        S(10,13)=DY*JY/24.*(-(G45(L)+G54(L))/R4+(E23(L)+E32(L))/2.)*H(L)
       X            -DX*JX*E22(L)*T2/12.
        S(10,14)=DY*JY/24.*((E23(L)+E32(L))/2.+(G45(L)+G54(L))/R4)*H(L)-DX
       X            *JX*(E22(L)*T2+G55(L)*T1/R4)/12.
        S(10,15)=DY*JY/48.*(E23(L)+E32(L))*H(L)+DX*JX*G55(L)*T1/R4/12.
       X            -DX*JX*E22(L)*T2/12.
        S(10,16)=S(10,13)
        S(10,17)=S(10,14)
        S(10,18)=S(10,15)
        S(11,11)=DXY*G44(L)*R3/12.+E33(L)*T3/DYX/2.
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      S(11,12)=DXY*(G45(L)+G54(L))/R4/24.+(E23(L)+E32(L))*T3/DYX/4.
      S(11,13)=-DY*JY*G44(L)*R2/12.+JP*DX*JX*(E23(L)+E32(L))*T2/24.
      S(11,14)=DY*JY*G44(L)*R2/12.-DX*JX*(G45(L)+G54(L)-(E23(L)+E32(L))
     X         *JP*T2)/24.
      S(11,15)=DX*JX*(G45(L)+G54(L)+JP*(E23(L)+E32(L))*T2)/24.
      S(11,16)=S(11,13)
      S(11,17)=S(11,14)
      S(11,18)=S(11,15)
      S(12,12)=DXY*G55(L)*T1/R4/R4/12.+E22(L)*T3/DYX/2.
      S(12,13)=-DY*JY*(G45(L)+G54(L))*H(L)/R4/24.+DX*JX*E22(L)*T2/12.
     X         *JP
      S(12,14)=DY*JY*(G45(L)+G54(L))*H(L)/R4/24.
     X         -DX*JX*(G55(L)*T1/R4-JP*E22(L)*T2)/12.
      S(12,15)=DX*JX*(G55(L)*T1/R4+JP*E22(L)*T2)/12.
      S(12,16)=S(12,13)
      S(12,17)=S(12,14)
      S(12,18)=S(12,15)
      S(13,13)=JP*DXY*E22(L)*T1/48.+DYX*G44(L)*R1/8.
      S(13,14)=JP*DXY*E22(L)*T1/96.-DYX*G44(L)*R1/8.+(G45(L)+G54(L))*H(L)
     X         )/16.*JC
      S(13,15)=JP*DXY*E22(L)*T1/96.-(G45(L)+G54(L))*H(L)/16.*JC
      S(13,16)=S(13,13)
      S(13,17)=S(13,14)
      S(13,18)=S(13,15)
      S(14,14)=JP*DXY*E22(L)*T1/48.+DYX*G44(L)*R1/8.-(G45(L)+G54(L))
     X         *H(L)/8.*JC+G55(L)*T1/8./DYX
      S(14,15)=JP*DXY*E22(L)*T1/96.+(G45(L)+G54(L))*H(L)/16.*JC-G55(L)
     X         *T1/8./DYX
      S(14,16)=S(13,14)
      S(14,17)=S(14,14)
      S(14,18)=S(14,15)
      S(15,15)=JP*DXY*E22(L)*T1/48.+G55(L)*T1/8./DYX
      S(15,16)=S(13,15)
      S(15,17)=S(14,15)
      S(15,18)=S(15,15)
      S(16,16)=S(13,13)
      S(16,17)=S(13,14)
      S(16,18)=S(13,15)
      S(17,17)=S(14,14)
      S(17,18)=S(14,15)
      S(18,18)=S(15,15)
      DO 111 JC=1,18
      DO 111 KC=1,18
  111 S(KC,JC)=S(JC,KC)
      L11=L
      DO 349 I=1,9
      DO 349 J=1,18
  349 ST(I,J)=0.D0
      IF ( MCD .EQ. 4) GO TO 334
      IF (MCD .EQ. 3) GO TO 331
      IF (MCD .EQ. 2) GO TO 332
      GO TO 333
  331  DX=-DX
       R9=-R9
      R10=-R10
      GO TO 333
```

```
AYSHL   LASHEL.FOR        FORTRAN V.5A(621) /KI   23-MAY-76        12:38   PAGE 1-8

16848      332   DX=-DX
16849            GO TO 333
16850      334   R9=-R9
16851            R10=-R10
16859      333   ST( 1,1)=-E11(L)/DX
16860            ST(1,2)=-E13(L)/DX
16870            ST(1,3)=E11(L)/DX-E13(L)/R10
16880            ST(1,4)=-E12(L)/R10+E13(L)/DX
16890            ST(1,5)=E13(L)/R10
16900            ST(1,6)=E12(L)/R10
16910            ST(1,13)=JP*E12(L)/R/4.
16912            ST(1,14)=JP*ST(1,13)/2.
16920            ST(2,7)=ST(1,1)
16930            ST(2,8)=ST(1,2)
16940            ST(2,9)= E11(L)/DX-E13(L)/R9
16950            ST(2,10)=-E12(L)/R9+E13(L)/DX
16960            ST(2,11)=E13(L)/R9
16970            ST(2,12)=E12(L)/R9
16980            ST(2,13)=JP*E12(L)/4./(R+HS(L))
16982            ST(2,14)=JP*ST(2,13)/2.
16990            ST(3,1)=-E21(L)/DX
17000            ST(3,2)=-E23(L)/DX
17010            ST(3,3)=E21(L)/DX-E23(L)/R10
17020            ST(3,4)=-E22(L)/R10+E23(L)/DX
17030            ST(3,5)=E23(L)/R10
17040            ST(3,6)=E22(L)/R10
17050            ST(3,13)=JP*E22(L)/4./R
17051            ST(3,14)=ST(3,13)/2.
17060            ST(4,7)=ST(3,1)
17070            ST(4,8)=ST(3,2)
17080            ST(4,9)=E21(L)/DX-E23(L)/R9
17090            ST(4,10)=-E22(L)/R9+E23(L)/DX
17100            ST(4,11)=E23(L)/R9
17110            ST(4,12)=E22(L)/R9
17120            ST(4,13)=JP*E22(L)/4./(R+HS(L))
17121            ST(4,14)=ST(4,13)/2.
17130            ST(5,1)=-E31(L)/DX
17140            ST(5,2)=-E33(L)/DX
17150            ST(5,3)=E31(L)/DX-E33(L)/R10
17160            ST(5,4)=-E32(L)/R10+E33(L)/DX
17170            ST(5,5)=E33(L)/R10
17180            ST(5,6)=E32(L)/R10
17190            ST(5,13)=JP*E32(L)/4./R
17191            ST(5,14)=ST(5,13)/2.
17200            ST(6,7)=ST(5,1)
17210            ST(6,8)=ST(5,2)
17220            ST(6,9)=E31(L)/DX-E33(L)/R9
17230            ST(6,10)=-E32(L)/R9+E33(L)/DX
17240            ST(6,11)=E33(L)/R9
17250            ST(6,12)=E32(L)/R9
17260            ST(6,13)=JP*E32(L)/4./(R+HS(L))
17261            ST(6,14)=ST(6,13)/2.
17270            DO 348 MJA=1,6
17290      348   ST(MJA,15)=ST(MJA,14)
17291            DO 347 MJC=1,6
17292            DO 347 MJD=17,18
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
 347   ST(MJC,MJD)=ST(MJC,14)
       DO 346 MJE=1,6
 346   ST(MJE,16)=ST(MJE,13)
       ST(7,1)=-G54(L)/2./H(L)
       ST(7,2)=-G55(L)*R9/2./H(L)/R10
       ST(7,3)=ST(7,1)/2.
       ST(7,4)=ST(7,2)/2.
       ST(7,5)=ST(7,3)
       ST(7,6)=ST(7,4)
       ST(7,7)=-ST(7,1)
       ST(7,8)=G55(L)/2./H(L)
       ST(7,9)=ST(7,7)/2.
       ST(7,10)=ST(7,8)/2.
       ST(7,11)=ST(7,9)
       ST(7,12)=ST(7,10)
       ST(7,13)=-G54(L)/2./DX
       ST(7,14)=-G55(L)/2./R10+G54(L)/2./DX
       ST(7,15)=G55(L)/2./R10
       ST(7,16)=ST(7,13)
       ST(7,17)=ST(7,14)
       ST(7,18)=ST(7,13)
       ST(8,1)=-G54(L)/2./H(L)
       ST(8,2)=-G55(L)/2./H(L)
       ST(8,3)=ST(8,1)/2.
       ST(8,4)=ST(8,2)/2.
       ST(8,5)=ST(8,3)
       ST(8,6)=ST(8,4)
       ST(8,7)=-ST(8,1)
       ST(8,8)=G55(L)*R10/2./H(L)/R9
       ST(8,9)=ST(8,7)/2.
       ST(8,10)=ST(8,8)/2.
       ST(8,11)=ST(8,9)
       ST(8,12)=ST(8,10)
       ST(8,13)=-G54(L)/2./DX
       ST(8,14)=-G55(L)/2./R9+G54(L)/2./DX
       ST(8,15)=G55(L)/2./R9
       ST(8,16)=ST(8,13)
       ST(8,17)=ST(8,14)
       ST(8,18)=ST(8,15)
       ST(9,1)=-G44(L)/2./H(L)
       ST(9,2)=-G45(L)*R9/2./H(L)/R10
       ST(9,3)=ST(9,1)/2.
       ST(9,4)=ST(9,2)/2.
       ST(9,5)=ST(9,3)
       ST(9,6)=ST(9,4)
       ST(9,7)=-ST(9,1)
       ST(9,8)=G45(L)/2./H(L)
       ST(9,9)=ST(9,7)/2.
       ST(9,10)=ST(9,8)/2.
       ST(9,11)=ST(9,9)
       ST(9,12)=ST(9,10)
       ST(9,13)=-G44(L)/2./DX
       ST(9,14)=-G45(L)/2./R10+G44(L)/2./DX
       ST(9,15)=G45(L)/2./R10
       ST(9,16)=ST(9,13)
       ST(9,17)=ST(9,14)
```

```
      ST(9,16)=ST(9,15)
C
C     2. SET GRAVITY LOAD MATRICES EQUAL ZERO
C
      DO 350 I=1,18
      DO 350 L=1,4
 350  P(I,L)=0.D0
      DO 375 L=1,18
 375  XM(L)=0.D0
      DO 376 L=1,4
      DO 376 J=1,9
 376  TT(J,L)=0.D0
C
C     3. FORM LOCATION MATRIX AND COMPUTE BAND WIDTH
C
      DO 400 L=1,2
      LM(L)=ID(I1,L)
      LM(L+2)=ID(J1,L)
      LM(L+4)=ID(K1,L)
      LM(L+6)=ID(I2,L)
      LM(L+8)=ID(J2,L)
 400  LM(L+10)=ID(K2,L)
      LM(13)=ID(I1,3)
      LM(14)=ID(J1,3)
      LM(15)=ID(K1,3)
      LM(16)=ID(I2,3)
      LM(17)=ID(J2,3)
      LM(18)=ID(K2,3)
      NDM=24
      ND=18
      NS=9
      IF (.NOT. ELPRT) GO TO 408
      WRITE (6,2007) ND,NS
      IF (ELPCH) WRITE (11,2008) N,ND,NS
      DO 406 L=1,NS
      IF (ELPCH) WRITE (11,2009)(ST(L,K),K=1,ND)
  406 WRITE (6,2010)(ST(L,K),K=1,ND)
      IF (ELPCH) WRITE (11,2009)((TT(L,K),K=1,4),L=1,NS)
      WRITE (6,2011)((TT(L,K),K=1,4),L=1,NS)
  408 CALL  CALBAN (MBAND,NDIF,LM,XM,S,P,ND,NDM,NS)
      NT1=1
      IF (MINBND .EQ. 0) GO TO 409
      NT1=4
      LMI1=LM(1)+LM(2)+LM(13)
      LMJ1=LM(3)+LM(4)+LM(14)
      LMK1=LM(5)+LM(6)+LM(15)
      LMI2=LM(7)+LM(8)+LM(16)
      LMJ2=LM(9)+LM(10)+LM(17)
      LMK2=LM(11)+LM(12)+LM(18)
      IF ((LMI1*LMJ1*LMK1*LMI2*LMJ2*LMK2) .NE. 0)
     XWRITE (5) I1,J1,K1,I2,J2,K2
 409  CONTINUE
      IF (IPLT .GT. 0) WRITE (13,*) I1,J1,K1,I2,J2,K2
      IF(MODEX.EQ.0) GO TO 410
C***  DATA PORTHOLE SAVE
      WRITE (NT8) M,I1,J1,K1,I2,J2,K2,L11
```

```
18390          GO TO 420
18400      410 CONTINUE
18410          WRITE(NT1)ND,NS,(LM(L),L=1,ND),((ST(L,K),L=1,NS),K=1,ND),
18420        X ((TT(L,K),L=1,NS),K=1,4)
18430    C
18440    C     4. CHECK FOR MORE ELEMENTS
18450    C
18460      420 CONTINUE
18470          WRITE(6,2004) M,I1,J1,K1,I2,J2,K2,L11,NDIF
18480          L=L11
18490          IF (M .EQ. NUME) RETURN
18520          GO TO 100
18530    C
18540     1003 FORMAT(4F10.1)
18550     1005 FORMAT(4I5,3I1)
18551     1006 FORMAT( 18F4.2 )
18560     2000 FORMAT ('1S H E L L   E L E M E N T S',///,
18570         X          ' NUMBER OF SHELL ELEMENTS=',I5,/,
18580         X          ' NUMBER OF DIFF.  LAYERS=',I5,/,
18590         X          ' RADIUS=',F13.3)
18600     2003 FORMAT(///25H ELEMENT LOAD MULTIPLIERS / 20X,1HA,14X,1HB,14X,1HC,
18610         X 14X,1HD,/6H X-DIR,4F10.1/ 6H Y-DIR,4F10.1/ 6H Z-DIR,4F10.1/
18620         X 6H  TEMP,4F10.1)
18630     2004 FORMAT(8I5,I7)
18640     2005 FORMAT(///47H1   N    I1    J1    K1    I2    J2    K2 LAYER  BAND )
18650     2007 FORMAT ('0NUMBER OF DISPLACEMENTS PER ELEMENT (ND) =',I3,/,
18660         X          '0NUMBER OF STRESSES PER ELEMENT (NS)        =',I3,/,
18670         X          '0ELEMENT STRESS-DISPL MATRIX ')
18680     2008  FORMAT ('ELEMENT',I3,'    ND=',I3,'    NS=',I3)
18690     2009 FORMAT ((1P8E10.3))
18700     2010 FORMAT (/,(1H ,1P10E13.4))
18710     2011 FORMAT ('0ELEMENT FIXED-NODE STRESSES ',/,(1H ,1P4E13.4))
18720          END

COMMON BLOCKS

/UNILOD/(+13552)
FFX       +0       FFY       +3716     FFZ       +7634

/ELPAR/(+30)
NPAR      +0       NNNNN     +16       NBAND     +17       NELTYP    +20       N1        +21
N2        +22      N3        +23       N4        +24       N5        +25       NTOT      +26
NEQ       +27
/EM/(+4052)
LM        +0       ND        +30       NS        +31       S         +32       P         +2232
XM        +2532    ST        +2612     TT        +3712

/JUNK/(+150)
EMUL      +0       I1        +40       J1        +41       K1        +42       I2        +43
J2        +44      K2        +45       L         +46       M         +47       N         +50
I         +51      J         +52       K         +53       X2        +54       X1        +56
Y2        +60      Y1        +62       DX        +64       DY        +66       DXY       +70
DYX       +72      DX2       +74       MCD       +76       R1        +77       R2        +101
R3        +103     R4        +105      R5        +107      R6        +111      R7        +113
R8        +115     R9        +117      R10       +121      MIN       +123      MAX       +124
```

```
AYSHL    LASHEL.FOR        FORTRAN V.5A(621) /KI    23-MAY-78        12:38    PAGE 1-12

NDIF     +125     HTYP      +126     HTYPE    +127     H         +130     L11       +132
H1       +133     T1        +134     T2       +136     T3        +140     T4        +142
T5       +144     T6        +146

/EXTRA/(+2)
MODEX    +0       NT6       +1

/CTL/(+12)
GRAV     +0       ELPRT     +2       ELPCH    +3       GENPRT    +4       GENPCH    +5
DEFPCH   +6       WTCG      +7       MINBND   +10      IPLT      +11

SUBPROGRAMS CALLED

DLOG.    CALBAN   DABS.

SCALARS AND ARRAYS ( "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED )

 .S0020 1         *JP      2         *AR3     3         QY       5         .I0010 3725
 E22    3724      %Z                 *MJD     3746      *LMK2    3747      %T
 .S0034 3750      E33      3751      .S0033 3775        HS       3774      .S0032 4016
 .S0031 4017      *NUMNP   4020      .S0030 4021        H        4022      QX       4044
 E12    7762      *MJA     10004     *LMK1    10005     *NOM     10006     *JC      10007
 E23    10010     *MJE     10032     G54      10033     Y        10055     *JY      10056
*AR1    10057     ID       10061     E13      10062     *LMI2    10104     .S0007 10105
 .S0006 10106     .S0005 10107       G44      10113     .S0004 10132       .S0003 10133
*JX     10134     E31      10135     .S0002 10157       *NUML    10160     FZ       10161
 .S0001 14077     .S0000 14100       *NT1     14101     *NUME    14102     G55      14103
*LM11   14125     *ML      14126     .S0017 14127       X        14130     .S0016 14131
*AR2    14132     .S0015 14134       .S0014 14135       .I0007 14136       E21      14137
 .S0013 14161     .I0006 14162       .S0012 14163       *MJC     14164     .I0005 14165
 .S0011 14166     .I0004 14167       *LMJ2    14170     .S0010 14171       *L1      14172
 .I0003 14173     .I0002 14174       .I0001 14175       G45      14176     QZ       14220
 .I0000 20136     E32      20137     .S0027 20161       .S0026 20162       .S0025 20163
 E11    20164     .S0024 20206       *LMJ1    20207     .S0023 20210       *KC      20211
 .S0022 20212     .S0021 20213

TEMPORARIES

 .A0016 20407     .Q0000 20410       .Q0001 20411       .Q0002 20412       .Q0003 20413

AYSHL    ( NO ERRORS DETECTED )
```

```
      SUBROUTINE PRINTD (ID,F,FREQ,NF,NEQB,NUMNP,LL,NBLOCK,NEQ,NSB,NT,
     1                  MQ)
      IMPLICIT REAL*8(A-H,O-Z)
      REAL FR
      LOGICAL ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH
C
C     CALLED BY SOLEQ,SOLEIG,RESPEC
C
C     MQ=1       STATIC SOLUTION
C     MQ=2       DYNAMIC SOLUTION
C     MQ=3       RESPONSE SPECTRUM ANALYSIS
C
      DIMENSION ID(NUMNP,6),D(6),F(NSB,LL),FREQ(NF)
      COMMON /CTL/ GRAV,ELPRT,ELPCH,GENPRT,GENPCH,DEFPCH
C
C     READ THE ID ARRAY AND THEN READ THE SOLUTION INTO CORE
C
      REWIND 8
      IF(MQ.EQ.3)REWIND 7
      READ (8) ID
      REWIND NT
      IF (MQ .EQ. 3) DEFPCH=.FALSE.
      IF (MQ .EQ. 1) GO TO 110
      IF(MQ.NE.3) READ (NT) FREQ
      IF(MQ.EQ.3) READ (7) FREQ
      IF(MQ.EQ.3) READ (NT)
      TPI=8.0D0*DATAN(1.0D0)
      DO 100 N=1,NF
      FREQ(N)=FREQ(N)/TPI
  100 CONTINUE
  110 CONTINUE
      NE=NSB
      NS=NE+1-NEQB
      DO 120 N=1,NBLOCK
      IF(MQ.EQ.3) READ(7)
      READ (NT) ((F(J,K),J=NS,NE),K=1,LL)
      NS=NS-NEQB
  120 NE=NE-NEQB
C
C     PRINT THE UNRESTRAINED NODES' DISPLACEMENTS/ROTATIONS
C
      DO 190 L=1,LL
      GO TO (130,140,150),MQ
  130 WRITE (6,2000)L
      WRITE (6,2030)
      GO TO 160
  140 FR=SNGL(FREQ(L))
      WRITE (6,2010) L,FR
      WRITE (6,2030)
      GO TO 160
  150 FR=SNGL(FREQ(L))
      IF (L .LT. LL) WRITE (6,2020) L,FR
      IF (L .EQ. LL) WRITE (6,2040)
      WRITE (6,2030)
  160 DO 180 I=1,NUMNP
      IFLG=0
```

```
PRINTD  LASHEL.FOR       FORTRAN V.5A(621) /KI    25-MAY-78        12:38   PAGE 1-1

19290             DO 170 J=1,6
19300             D(J)=0.0D0
19310             N=ID(I,J)
19320             IF (N .EQ. 0) GO TO 170
19330             IF(N.LT.0)NAPG=-N
19340             IF(N.LT.0)N=ID(NAPG,J)
19350             IFLG=1
19360             D(J)=F(N,L)
19370     170     CONTINUE
19380             IF (IFLG .EQ. 0) GO TO 180
19390             WRITE (6,2050) I,D
19400             IF (DEFPCH) WRITE (11,2060) I,L,D
19410     180     CONTINUE
19420             IF (DEFPCH) WRITE (11,2070)
19430     190     CONTINUE
19440     2000    FORMAT ('1S T A T I C   A N A L Y S I S',//,' LOAD CASE',I5)
19450     2030    FORMAT (
19460            X'0DISPLACEMENTS/ROTATIONS OF UNRESTRAINED NODES',//,
19470            X'  NODE ',2(12X,'X-',12X,'Y-',12X,'Z-'),/,
19480            X' NUMBER',3(3X,'TRANSLATION'),3(6X,'ROTATION'))
19490     2010    FORMAT('1M O D A L   A N A L Y S I S',//,' MODE NUMBER',I5/,
19500            X            ' FREQUENCY=',1PG13.6,' HZ',//,
19510            X            ' EIGENVECTORS NORMALIZED TO A UNIT MASS MATRIX')
19520     2020    FORMAT('1R E S P O N S E   S P E C T R U M   A N A L Y S I S',//,
19530            X            ' RESPONSE FOR MODE',I5,/,' FREQUENCY=',1PG14.6,' HZ')
19540     2040    FORMAT('1R E S P O N S E   S P E C T R U M   A N A L Y S I S',//,
19550            X            ' SQUARE ROOT OF THE SUM OF THE SQUARES OF THE',
19560            X            ' NODAL DEFLECTIONS')
19570     2050    FORMAT(I6,1X,1P6D14.5)
19580     2060    FORMAT (2I3,2X,1P6D12.5)
19590     2070    FORMAT (/)
19600             RETURN
19610             END

COMMON BLOCKS

/CTL/(+7)
GRAV     +0         ELPRT    +2         ELPCH    +3         GENPRT   +4         GENPCH  +5
DEFPCH   +6

SUBPROGRAMS CALLED

DATAN.   SNGL.

SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*TP1      1          FR       3          *LL       4          *NEQB     5          *NS       6
*NBLOCK   7          *N       10         *K        11         *NUMNP    12         %NEQ
*NF       13         *IFLG    14         ID        15         *J        16         .S0006   17
 .S0005   20         D        21         .S0004    35         *NSB      36         .S0003   37
*NE       40         .S0002   41         .S0001    42         .S0000    43         *NAPG     44
 .I0007   45         .I0006   46         .I0005    47         .I0004    50         *MU       51
 .I0003   52         *L       53         .I0002    54         .I0001    55         *I        56
 .I0000   57         FREQ     60         F         61         *NT       62
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
PRINTD  LASHEL.FOR      FORTRAN V.5A(621) /KI   23-MAY-76       12:38   PAGE 1-2

TEMPORARIES
 .A0016 260
PRINTD  ( NO ERRORS DETECTED )
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      SUBROUTINE SESOL (A,B,MAXA,NEQ,MA,NV,NBLOCK,NEQB,NAV,MI,NSTIF,
     1                  NRED,NL,NR)
      IMPLICIT REAL*8(A-H,O-Z)
C
C     CALLED BY   SOLEQ
C
       DIMENSION A(NAV),B(NAV),MAXA(MI)
C
      MM=1
       MA2=MA - 2
      IF(MA2.EQ.0) MA2=1
       INC=NEQB - 1
       NWA=NEQB*MA
       NTB=(MA-2)/NEQB + 1
       NEB=NTB*NEQB
       NEBT=NEB + NEQB
       NWV=NEQB*NV
       NWVV=NEBT*NV
C
       N1=NL
       N2=NR
       REWIND NSTIF
       REWIND NRED
       REWIND N1
       REWIND N2
C
C      MAIN LOOP OVER ALL BLOCKS
       DO 600 NJ=1,NBLOCK
       IF (NJ.NE.1) GO TO 10
       READ (NSTIF) A
      IF(NEQ.GT.1) GO TO 100
      MAXA(1)=1
      WRITE(NRED) A,MAXA
      IF(A(1)) 1,174,3
    1 KK=1
      WRITE(6,1010) KK,A(1)
    3 DO 5 L=1,NV
    5 A(1+L)=A(1+L)/A(1)
      KR=1+NV
      WRITE(NL) (A(KK),K=2,KR)
      RETURN
 10    IF (NTB.EQ.1) GO TO 100
       REWIND N1
       REWIND N2
       READ (N1) A
C
C      FIND COLUMN HEIGHTS
 100   KU=1
       KN=MINO(MA,NEQB)
       MAXA(1)=1
       DO 110 N=2,MI
       IF (N-MA) 120,120,130
 120   KU=KU + NEQB
       KK=KU
      MM=MINO(N,KN)
       GO TO 140
```

```
        130    KU=KU + 1
               KK=KU
               IF (N-NEQB) 140,140,136
        136    MM=MM - 1
        140    DO 160 K=1,MM
               IF (A(KK)) 110,160,110
        160    KK=KK - INC
        110    MAXA(N)=KK
       C
               IF (A(1)) 172,174,176
        174    KK=(NJ-1)*NEQB + 1
               IF (KK.GT.NEQ) GO TO 590
               WRITE (6,1000) KK
               STOP
        172    KK=(NJ-1)*NEQB + 1
               WRITE (6,1010) KK,A(1)
       C
       C       FACTORIZE LEADING BLOCK
        176    DO 200 N=2,NEQB
               NH=MAXA(N)
               IF (NH-N) 200,200,210
        210    KL=N + INC
               K=N
               D=0.D0
               DO 220 KK=KL,NH,INC
               K=K - 1
               C=A(KK)/A(K)
               D=D + C*A(KK)
        220    A(KK)=C
               A(N)=A(N) - D
       C
               IF (A(N)) 222,224,230
        224    KK=(NJ-1)*NEQB + N
               IF (KK.GT.NEQ) GO TO 590
               WRITE (6,1000) KK
               STOP
        222    KK=(NJ-1)*NEQB + N
               WRITE (6,1010) KK,A(N)
       C
        230    IC=NEQB
               DO 240 J=1,MA2
               MJ=MAXA(N+J) - IC
               IF (MJ-N) 240,240,280
        280    KU=MIN0(MJ,NH)
               KN=N + IC
               C=0.D0
               DO 300 KK=KL,KU,INC
        300    C=C + A(KK)*A(KK+IC)
               A(KN)=A(KN) - C
        240    IC=IC + NEQB
       C
               K=N + NWA
               DO 430 L=1,NV
               KJ=K
               C=0.D0
               DO 440 KK=KL,NH,INC
```

```
            KJ=KJ - 1
 440        C=C + A(KK)*A(KJ)
            A(K)=A(K) - C
 430        K=K + NEQB
C
 200        CONTINUE
C
C           CARRY OVER INTO TRAILING BLOCKS
            DO 400 NK=1,NTB
            IF ((NK+NJ).GT.NBLOCK) GO TO 402
            MI=NI
            IF ((NJ.EQ.1).OR.(NK.EQ.NTB)) MI=NSTIF
            READ (MI) B
            ML=NK*NEQB + 1
            MR=MIN0((NK+1)*NEQB,MI)
           IF(MA.EQ.1) ML=MR
            MD=MI - ML
            KL=NEQB + (NK-1)*NEQB*NEQB
            N=1
C
            DO 500 M=ML,MR
            NH=MAXA(M)
            KL=KL + NEQB
            IF (NH-KL) 505,510,510
 510        K=NEQB
            D=0.D0
            DO 520 KK=KL,NH,INC
            C=A(KK)/A(K)
            D=D + C*A(KK)
            A(KK)=C
 520        K=K - 1
            B(N)=B(N) - D
            IF (MD) 580,580,530
 530        IC=NEQB
            DO 540 J=1,MD
            MJ=MAXA(M+J) - IC
            IF (MJ-KL) 540,550,550
 550        KU=MIN0(MJ,NH)
            KN=N + IC
            C=0.D0
            DO 575 KK=KL,KU,INC
 575        C=C + A(KK)*A(KK+IC)
            B(KN)=B(KN) - C
 540        IC=IC + NEQB
C
 580        KN=N + N*A
            K=NEQB + N*A
            DO 610 L=1,NV
            KJ=K
            C=0.D0
            DO 620 KK=KL,NH,INC
            C=C + A(KK)*A(KJ)
 620        KJ=KJ - 1
            B(KN)=B(KN) - C
            KN=KN + NEQB
 610        K=K + NEQB
```

```
C
 505   MD=MD - 1
 500   N=N + 1
C
       IF (NTB.NE.1) GO TO 560
       WRITE (NRED) A,MAXA
       DO 570 I=1,NAV
 570   A(I)=B(I)
       GO TO 600
 560   WRITE(N2) B
C
 400   CONTINUE
C
       M=N1
       N1=N2
       N2=M
 590   WRITE (NRED) A,MAXA
C
 600   CONTINUE
C
C      VECTOR BACKSUBSTITUTION
       DO 700 K=1,NWVV
 700   B(K)=0.D0
       REWIND NL
C
       DO 800 NJ=1,NBLOCK
       BACKSPACE NRED
       REWIND NRED
       NJB=NBLOCK-NJ+1
       DO 801 NJA=1,NJB
 801     READ (NRED) A,MAXA
       BACKSPACE NRED
       K=NEBT
       DO 810 L=1,NV
       DO 820 I=1,NEB
       B(K)=B(K-NEQB)
 820   K=K - 1
 810   K=K + NEBT + NEB
       KN=0
       KK=NWA
       NDIF=NEQB
       IF (NJ.EQ.1) NDIF=NEQB - (NBLOCK*NEQB - NEQ)
       DO 855 L=1,NV
       DO 850 K=1,NDIF
 850   B(KN+K)=A(KK+K)/A(K)
       KK=KK + NEQB
 855   KN=KN + NEQT
      IF(MA.EQ.1) GO TO 915
       ML=NEQB + 1
       KL=NEQB
       DO 860 M=ML,MI
       KL=KL + NEQB
       KU=MAXA(M)
       IF (KU-KL) 860,870,870
 870   K=NEQB
       KH=K
```

```
21860              DO 880 L=1,NV
21870              KJ=K
21880              DO 890 KK=KL,KU,INC
21890              B(KJ)=B(KJ) - A(KK)*B(KM)
21900        890   KJ=KJ - 1
21910              KM=KM + NEBT
21920        880   K=K + NEBT
21930        860   CONTINUE
21940              N=NEQB
21950              DO 910 I=2,NEQB
21960              KL=N + INC
21970              KU=MAXA(N)
21980              IF (KU-KL) 910,920,920
21990        920   K=N
22000              DO 930 L=1,NV
22010              KJ=K
22020              DO 940 KK=KL,KU,INC
22030              KJ=KJ - 1
22040        940   B(KJ)=B(KJ) - A(KK)*B(K)
22050        930   K=K + NEBT
22060        910   N=N - 1
22070        C
22080         915 KK=0
22090              KN=0
22100              DO 950 L=1,NV
22110              DO 960 K=1,NEQB
22120              KK=KK + 1
22130        960   A(KK)=B(KN+K)
22140        950   KN=KN + NEBT
22150        C
22160              WRITE (NL) (A(K),K=1,NWV)
22170        800   CONTINUE
22180        C
22190         1000 FORMAT (// 46H   STOP  ***  ZERO DIAGONAL ENCOUNTERED DURING,
22200             X            18H EQUATION SOLUTION, /
22210             X        13X,18H EQUATION NUMBER =, I6 )
22220         1010 FORMAT (/  50H WARNING ***  NEGATIVE DIAGONAL ENCOUNTERED DURING,
22230             X            18H EQUATION SOLUTION, /
22240             X        13X,18H EQUATION NUMBER =, I6, 5X, 7HVALUE =, D20.6 )
22250        C
22260              RETURN
22270              END

SUBPROGRAMS CALLED

MIN0.

SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

 .S0020 1        *KN      2       *MJ      3       *NH      4       *NEQ     5
*NEQB   6         .S0037 7        *MD      10       .S0036 11       *NRED    12
 .S0035 13       *NI      14      *NBLOCK  15       .S0034 16       *N       17
*NSTIF  20        .S0033 21       *NEBT    22       .S0032 23       *NJB     24
*K      25        .S0031 26        .S0030 27       *KM      30       *MI      31
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
SESOL    LASHE .FOR        FORTRAN V.5A(621) /KI    23-MAY-78        12:38    PAGE 1-3

 MAXA    32       *NWVV    33       *NEQ     34        D       35       *NR      36
*KR      37       *NAV     40       *NL      41        .S0042 42        .S0041 43
*KL      44        .S0040 45       *NTB     46       *NJIF    47       *NWV     50
*INC     51       *M       52       *J       53       *MN      54       *NK      55
 .S0007 56        .S0006 57       *KK      60       *D       61        .S0005 63
 .S0004 64       *NV      65        .S0003 66       *NWA     67        A       70
 .S0002 71        .S0001 72       *MR      73        .S0020 74       *MA      75
*IC      76       *MA2     77       *ML      100      *NJ      101       .S0017 102
*KJ      103       .S0016 104       .S0015 105       .S0014 106       .S0013 107
*KU      110       .S0012 111       .I0005 112       .S0011 113       .I0004 114
 .S0010 115        .I0003 116      *L       117       .I0002 120       .I0001 121
*I       122       .I0000 123      *NI      124      *NJA     125      *C       126
 .S0027 130        .S0026 131       .S0025 132       .S0024 133      *N2      134
 .S0023 135        .S0022 136       .S0021 137

TEMPORARIES

 .A0016 217       .Q0000 220

SESOL    [ NO ERRORS DETECTED ]
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
22280           SUBROUTINE SOLEQ
22290           IMPLICIT REAL*8(A-H,O-Z)
22300   C
22310   C       CALLS   SESOL,PRINTD,STRESS
22320   C       CALLED BY    MAIN
22330   C
22340   C       STATIC SOLUTION PHASE
22350   C
22360           COMMON /GAR/ A(9944)
22370           COMMON /ELPAR/ NP(14),NUMNP,MBAND,NELTYP,N1,N2,N3,N4,N5,MTOT,NEQ
22380           COMMON /SOL  / NBLOCK,NEQB,LL,NF,IFILL(7)
22390   C
22400           REAL  TT(4)
22410   C
22420   C       SOLVE FOR THE DISPLACEMENT VECTORS
22430
```

```
SOLEQ     LASHEL.FOR       FORTRAN V.5A(621) /KI     26-MAY-78        12:36    PAGE 2

22440    C
22450             NSB=(MBAND+LL)*NEQB
22460             NSBB=NEQB*LL*(2+(MBAND-2)/NEQB)
22470             IF(NSBB.LT.NSB) NSBB=NSB
22480             N3=N1+NSB
22490             N4=N3+NSBB
22500             MI = MBAND + NEQB -1
22510             CALL  SESOL (A(N1),A(N3),A(N4),NEQ,MBAND,LL,NBLOCK,NEQB,NSB,MI,
22520            X             4,3,2,7)
22530    C
22540    C        PRINT DISPLACEMENTS
22550    C
22560             N2=N1+NUMNP*6
22570             NSB=NEQB*NBLOCK
22580             N4=N2+NSB*LL
22590             N5=N4+1
22600             CALL  ERROR(N5)
22610             CALL  PRINTD(A(N1),A(N2),A(N4),1,NEQB,NUMNP,LL,NBLOCK,
22620            X             NEQ,NSB,2,1)
22630    C
22640    C        COMPUTE AND PRINT ELEMENT STRESSES
22650    C
22660             N2=N1+4*LL
22670             N3=N2+NEQB*LL
22680             LB=(MTOT-N3)/(NEQ +12)
22690             CALL  STRESS(A(N1),A(N2),A(N3),NEQB,LB,LL,NEQ,NBLOCK)
22700    C
22710             RETURN
22720             END

COMMON BLOCKS

/GAR/(+47036)
A         +0
/ELPAR/(+30)
NP        +0        NUMNP     +16       MBAND     +17       NELTYP    +20       N1        +21
N2        +22       N3        +23       N4        +24       N5        +25       MTOT      +26
NEQ       +27
/SOL/(+13)
NBLOCK    +0        NEQB      +1        LL        +2        NF        +3        IFILL     +4

SUBPROGRAMS CALLED

STRESS  SESOL   PRINTD  ERROR

SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*MI       1         *NSBB     2         *NSB      3         *LB       4         4TT
```

```
SOLEQ   LASHEL.FOR       FORTRAN V.5A(521) /KI   23-MAY-76       12:38   PAGE 2-1

TEMPORARIES
 .A0016 5        .Q0000 6        .Q0001 7        .Q0002 10
SOLEQ   [ NO ERRORS DETECTED ]
```

```
      SUBROUTINE STRESS(STR,B,D,NEQB,LB,LL,NEQ,NBLOCK)
      IMPLICIT REAL*8(A-H,O-Z)
C
C     CALLS    ELTYPE
C     CALLED BY    SOLEQ
C
      DIMENSION D(NEQ,LB),B(NEQB,LL),STR(4,LL)
      COMMON /ELPAR/ NPAR(14),NUMNP,MBAND,NELTYP,N1,N2,N3,N4,N5,MTOT,NEQ
      COMMON /JUNK/ LT,LH
      COMMON /EXTRA/ MODEX,NT8,N10SV,NT10
C
      READ (8,*) STR
      NT=(LL-1)/LB +1
      LH=0
C***  STRESS PORTHOLE
      IF(N10SV.EQ.1)
     XWRITE (NT10) NELTYP,NT
C
      DO 1000 II=1,NT
C
      LT =LH+1
      LLT=1-LT
      LH=LT+LB-1
      IF(LH.GT.LL) LH=LL
C
C     MOVE DISPLACEMENTS INTO CORE FOR LB LOAD CONDITIONS
C
      REWIND 2
C***  STRESS PORTHOLE
      IF(N10SV.EQ.1)
     XWRITE (NT10) LT,LH
      NQ=NEQB*NBLOCK
      DO 200 NN=1,NBLOCK
      READ (2) B
      N=NEQB
      IF (NN.EQ.1) N=NEQ-NQ+NEQB
      NQ=NQ-NEQB
      DO 200 J=1,N
      I=NQ+J
      DO 200 L=LT,LH
      K=L+LLT
  200 D(I,K)=B(J,L)
      LK=LH-LT+1
C
C     CALCULATE STRESSES FOR ALL ELEMENTS FOR LB LOAD CONDITIONS
C
      REWIND 1
      DO 1000 M=1,NELTYP
      READ (1) NPAR
C***  STRESS PORTHOLE
      IF(N10SV.EQ.1)
     XWRITE (NT10) NPAR
      MTYPE=NPAR(1)
      NPAR(1)=0
      CALL  ELTYPE(MTYPE)
 1000 CONTINUE
```

```
STRSC   LASHEL.FOR       FORTRAN V.5A(621) /KI   23-MAY-76        12:38   PAGE 1

23320         SUBROUTINE STRSC(STR,D,NEQ,NTAG)
23330         IMPLICIT REAL*8(A-H,O-Z)
23340   C
23350   C     CALLED BY LAYSHL
23360   C
23370         DIMENSION STR(4,1),D(NEQ,1)
23380         COMMON /JUNK/ LT,LH,L,IPAD,SG(20),SIG(7)
23390         COMMON /EM/ NS,ND,B(42,63),TI(42,4),LM(63)
23400   C
23410         IF (NTAG.EQ.0) GO TO 800
23420         LL=L-LT+1
23430         DO 300 I=1,NS
23440         SG(I)=0.0D0
23450         DO 300 J=1,4
23460     300 SG(I)=SG(I)+TI(I,J)*STR(J,L)
23470         DO 500 J=1,ND
23480         JJ=LM(J)
23490         IF(JJ.EQ.0) GO TO 500
23500         DO 400 I=1,NS
23510     400 SG(I)=SG(I)+B(I,J)*D(JJ,LL)
23520   C
23530     500 CONTINUE
23540         GO TO 900
23550     800 READ (1) ND,NS,(LM(I),I=1,ND),((B(I,J),I=1,NS),J=1,ND),
23560        1 ((TI(I,J),I=1,NS),J=1,4)
23570     900 RETURN
23580         END

COMMON BLOCKS

/JUNK/(+72)
LT        +0        LH        +1        L         +2        IPAD      +3        SG        +4
SIG       +54
/EM/(+13075)
NS        +0        ND        +1        B         +2        TI        +12256  LM        +12776

SUBPROGRAMS CALLED


SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*LL       1         *JJ       2             STR       3         *NTAG     4          *NEQ      5
*J        6          .S0007 7               .S0006 10            .S0005 11            D         12
 .S0004 13           .S0003 14              .S0002 15            .S0001 16             .S0000 17
 .S0010 20           .I0002 21              .I0001 22           %I        23           .I0000 24

TEMPORARIES

 .A0016 25

STRSC   [ NO ERRORS DETECTED ]
```

```
STRESS  LASHEL.FOR       FORTRAN V.5A(621) /KI    23-MAY-78        12:38   PAGE 1-1

23290    C
23300            RETURN
23310            END

COMMON BLOCKS

/ELPAR/(+30)
NPAR     +0        NUMNP    +16      MBAND    +17      NELTYP  +20      N1       +21
N2       +22       N3       +23      N4       +24      N5      +25      NTOT     +26
NEQ      +27
/JUNK/(+2)
LT       +0        LH       +1

/EXTRA/(+4)
MODEX    +0        NT8      +1       N10SV    +2       NT10    +3

SUBPROGRAMS CALLED

ELTYPE

SCALARS AND ARRAYS [ "*" NO EXPLICIT DEFINITION - "%" NOT REFERENCED ]

*LL      1          .I0010 2         *NEQB    3        *NBLOCK 4        *N       5
 STR     6         *K      7         *LK      10       *NEQ    11        B       12
*NQ      13        *M      14        *J       15       *LLT    16        D       17
 .S0004  20         .S0003 21        *II      22        .S0002 23        .S0001  24
 .S0000  25         .I0007 26         .I0006  27        .I0005 30        .I0004  31
*LB      32         .I0003 33        *MTYPE   34       *L      35        .I0002  36
 .I0001  37        *I      40         .I0000  41       %NT     42       *NN      43

TEMPORARIES

 .A0016 44

STRESS  [ NO ERRORS DETECTED ]
```

ORIGINAL PAGE IS
OF POOR QUALITY

APPENDIX B : INPUT DATA FOR A SAMPLE PROBLEM

```
SHELL WITH HOLE
  542     1      1
   13   480      1    51                        0    1   900     0     0     0     0        0

 .0001.0      1100      350      0    1100       0    384     384     0      384
   .0       0.0988
   .0       0.1044
   .0        .11
   .0        .12
   .0        .13
   .0        .145
   .0        .16
   .0        .18
   .0        .2
  1.56       .0988
  1.56       .1044
  1.56       .11
  1.55       .12
  1.55       .13
  1.55       .145
  1.55       .16
  1.55       .18
  1.55       .2
  3.09       .0951
  3.09       .0988
  3.09       .1044
  3.09       .11
  3.09       .12
  3.09       .13
  3.09       .145
  3.09       .16
  3.09       .18
  3.09       .2
  4.54       .0891
  4.54       .0951
  4.54       .0988
  4.54       .1044
  4.54       .11
  4.54       .12
  4.54       .13
  4.54       .145
  4.54       .16
  4.54       .18
  4.54       .2
  5.88       .0809
  5.88       .0891
  5.88       .0951
  5.88       .0988
  5.88       .1044
  5.88       .11
  5.88       .12
  5.88       .13
  5.88       .145
  5.88       .16
  5.88       .18
  5.88       .2
  7.07       .0707
  7.07       .0809
  7.07       .0891
  7.07       .0951
  7.07       .0988
  7.07       .1044
  7.07       .11
  7.07       .12
  7.07      .13
  7.07      .145
  7.07      .16
  7.07      .18
  7.07      .2
  8.09      .0588
  8.09      .0707
  8.09      .0809
  8.09      .0891
  8.09      .0951
  8.09      .0988
  8.09      .1044
  8.09      .11
  8.09      .12
  8.09      .13
  8.09      .145
  8.09      .16
  8.09      .18
  8.09      .2
  8.91      .0454
  8.91      .0588
  8.91      .0707
  8.91      .0809
  8.91      .0891
  8.91      .0951
  8.91      .0988
  8.91      .1044
  8.91      .11
  8.91      .12
  8.91      .13
  8.91      .145
  8.91      .16
  8.91      .18
  8.91      .2
  9.51      .0309
  9.51      .0454
  9.51      .0588
  9.51      .0707
  9.51      .0809
  9.51      .0891
  9.51      .0951
  9.51      .0988
  9.51      .1044
  9.51      .11
  9.51      .12
  9.51      .13
  9.51      .145
  9.51      .16
  9.51      .18
  9.51      .2
    1100000
    3100000
    5100000
    7100000
    9100000
   11100000
   13100000
   15100000
   17111000
   35111000
   55111000
   77111000
```

```
883111000
33111000
69111000
05111000
41111000
39111000
37111000
35111000
33111000
31111000
29111000
27111000
25111000
23111000
21111000
19111000
17111000
15111000
13111000
11111000
09111000
07111000
71010000
388010000
       100.0
          .0             .0            .0           .0
          .0             .0            .0           .0
          .0             .0            .0           .0
          .0             .0            .0           .0
    1     1     19      211
    2    21      3       13
    3     3     21      231
    4    23      5       33
    5     5     23      251
    6    25      7       53
    7     7     25      271
    8    27      9       73
    9     9     27      291
   10    29     11       93
   11    11     29      311
   12    31     13      113
   13    13     31      331
   14    33     15      133
   15    15     33      351
   16    35     17      153
   17    19     39      374
   18    19     39      411
   19    41     21      193
   20    21     41      431
   21    43     23      213
   22    23     43      451
   23    45     25      233
   24    25     45      471
   25    47     27      253
   26    27     47      491
   27    49     29      273
   28    29     49      511
   29    51     31      293
   30    31     51      531
   31    53     33      313
   32    33     53      551
   33    55     35      333
   34    37     59      574
   35    37     59      611
   36    61     39      373
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
 37    39    61   631
 38    63    41   393
 39    41    63   651
 40    65    43   413
 41    43    65   671
 42    67    45   433
 43    45    67   691
 44    69    47   453
 45    47    69   711
 46    71    49   473
 47    49    71   731
 48    73    51   493
 49    51    73   751
 50    75    53   513
 51    53    75   771
 52    77    55   533
 53    87    81   794
 54    57    81   831
 55    83    59   573
 56    59    83   851
 57    85    61   593
 58    61    85   871
 59    87    63   613
 60    63    87   891
 61    89    65   633
 62    65    89   911
 63    91    67   653
 64    67    91   931
 65    93    69   673
 66    69    93   951
 67    95    71   693
 68    71    95   971
 69    97    73   713
 70    73    97   991
 71    99    75   733
 72    75    99  1011
 73   101    77   753
 74    79   105  1034
 75    79   105  1071
 76   107    81   793
 77    81   107  1091
 78   109    83   813
 79    83   109  1111
 80   111    85   833
 81    85   111  1131
 82   113    87   853
 83    87   113  1151
 84   115    89   873
 85    89   115  1171
 86   117    91   893
 87    91   117  1191
 88   119    93   913
 89    93   119  1211
 90   121    95   933
 91    95   121  1231
 92   123    97   953
 93    97   123  1251
 94   125    99   973
 95    99   125  1271
 96   127   101   993
 97   103   131  1294
 98   103   131  1331
 99   133   105  1053
100   105   133  1351
101   135   107  1053
102   107   135  1371
103   137   109  1073
104   139   137  1391
105  [illegible]
```

ORIGINAL [illegible]
OF POOR QUALITY

981

```
106  111  139  1411
107  141  113  1113
108  113  141  1431
109  143  115  1133
110  115  143  1451
111  145  117  1153
112  117  145  1471
113  147  119  1173
114  119  147  1491
115  149  121  1193
116  121  149  1511
117  151  123  1213
118  123  151  1531
119  153  125  1233
120  125  153  1551
121  155  127  1253
122  129  159  1574
123  127  159  1611
124  161  131  1293
125  131  161  1631
126  163  133  1313
127  133  163  1651
128  165  135  1333
129  135  165  1671
130  167  137  1353
131  137  167  1691
132  169  139  1373
133  139  169  1711
134  171  141  1393
135  141  171  1731
136  173  143  1413
137  143  173  1751
138  175  145  1433
139  145  175  1771
140  177  147  1453
141  147  177  1791
142  179  149  1473
143  149  179  1811
144  181  151  1493
145  151  181  1831
146  183  153  1513
147  153  183  1851
148  185  155  1533
149  157  189  1874
150  157  189  1911
151  191  159  1573
152  159  191  1931
153  193  161  1593
154  161  193  1951
155  195  153  1613
156  163  195  1971
157  197  165  1633
158  165  197  1991
159  199  167  1653
160  167  199  2011
161  201  169  1673
162  169  201  2031
163  203  171  1693
164  171  203  2051
165  205  173  1713
166  173  205  2071
167  207  175  1733
168  175  207  2091
169  209  177  1753
170  177  209  2111
171  211  179  1773
172  179  211  2131
```

```
174  181  213  2151
175  215  183  1813
176  183  215  2171
177  217  185  1833
178  187  223  2214
179  187  223  2251
180  225  189  1873
181  189  225  2271
182  227  191  1893
183  191  227  2291
184  229  193  1913
185  193  229  2311
186  231  195  1933
187  195  231  2331
188  233  197  1953
189  197  233  2351
190  235  199  1973
191  199  235  2371
192  237  201  1993
193  201  237  2391
194  239  203  2013
195  203  239  2411
196  241  205  2033
197  205  241  2431
198  243  207  2053
199  207  243  2451
200  245  209  2073
201  209  245  2471
202  247  211  2093
203  211  247  2491
204  249  213  2113
205  213  249  2511
206  251  215  2133
207  215  251  2531
208  253  217  2153
209  219  255  2571
210  257  221  2193
211  221  257  2591
212  259  223  2213
213  223  259  2611
214  261  225  2233
215  225  261  2631
216  263  227  2253
217  227  263  2651
218  265  229  2273
219  229  265  2671
220  267  231  2293
221  231  267  2691
222  269  233  2313
223  233  269  2711
224  271  235  2333
225  235  271  2731
226  273  237  2353
227  237  273  2751
228  275  239  2373
229  239  275  2771
230  277  241  2393
231  241  277  2791
232  279  243  2413
233  243  279  2811
234  281  245  2433
235  245  281  2831
236  283  247  2453
237  247  283  2851
238  285  249  2473
239  249  285  2871
240  287  251  2493
```

```
241  251  287  2891
242  289  253  2513
243  255  291  2931
244  293  257  2553
245  257  293  2951
246  295  259  2573
247  259  295  2971
248  297  261  2593
249  261  297  2991
250  299  263  2613
251  263  299  3011
252  301  265  2633
253  265  301  3031
254  303  267  2653
255  267  303  3051
256  305  269  2673
257  269  305  3071
258  307  271  2693
259  271  307  3091
260  309  273  2713
261  273  309  3111
262  311  275  2733
263  275  311  3131
264  313  277  2753
265  277  313  3151
266  315  279  2773
267  279  315  3171
268  317  281  2793
269  281  317  3191
270  319  283  2813
271  283  319  3211
272  321  285  2833
273  285  321  3231
274  323  287  2853
275  287  323  3251
276  325  289  2873
277  291  327  3291
278  329  293  2913
279  293  329  3311
280  331  295  2933
281  295  331  3331
282  333  297  2953
283  297  333  3351
284  335  299  2973
285  299  335  3371
286  337  301  2993
287  301  337  3391
288  339  303  3013
289  303  339  3411
290  341  305  3033
291  305  341  3431
292  343  307  3053
293  307  343  3451
294  345  309  3073
295  309  345  3471
296  347  311  3093
297  311  347  3491
298  349  313  3113
299  313  349  3511
300  351  315  3133
301  315  351  3531
302  353  317  3153
303  317  353  3551
304  355  319  3173
305  319  355  3571
306  357  321  3193
307  321  357  3591
308  359  323  3213
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
309   323   339   3611
310   361   325   3233
311   327   353   3651
312   365   329   3273
313   329   365   3671
314   367   331   3293
315   331   367   3691
316   369   333   3313
317   333   369   3711
318   371   335   3333
319   335   371   3731
320   373   337   3353
321   337   373   3751
322   375   339   3373
323   339   375   3771
324   377   341   3393
325   341   377   3791
326   379   343   3413
327   343   379   3811
328   381   345   3433
329   345   381   3831
330   383   347   3453
331   347   383   3851
332   385   349   3473
333   349   355   3371
334   387   351   3493
335   351   387   3891
336   389   353   3513
337   353   389   3911
338   391   355   3533
339   355   391   3931
340   393   357   3553
341   357   393   3951
342   395   359   3573
343   359   395   3971
344   397   361   3593
345   363   399   4011
346   401   365   3633
347   365   401   4031
348   403   367   3653
349   367   403   4051
350   405   369   3673
351   369   405   4071
352   407   371   3693
353   371   407   4091
354   409   373   3713
355   373   409   4111
356   411   375   3733
357   375   411   4131
358   413   377   3753
359   377   413   4151
360   415   379   3773
361   379   415   4171
362   417   381   3793
363   381   417   4191
364   419   383   3813
365   383   419   4211
366   421   385   3833
367   385   421   4231
368   423   387   3853
369   387   423   4251
370   425   389   3873
371   389   425   4271
372   427   391   3893
373   391   427   4291
374   429   393   3913
375   393   429   4311
376   431   395   3933
```

```
378  433  397  3953
379  399  435  4371
380  437  401  3993
381  401  437  4391
382  439  403  4013
383  403  439  4411
384  441  405  4033
385  405  441  4431
386  443  407  4053
387  407  443  4451
388  445  409  4073
389  409  445  4471
390  447  411  4093
391  411  447  4491
392  449  413  4113
393  413  449  4511
394  451  415  4133
395  415  451  4531
396  453  417  4153
397  417  453  4551
398  455  419  4173
399  419  455  4571
400  457  421  4193
401  421  457  4591
402  459  423  4213
403  423  459  4611
404  461  425  4233
405  425  461  4631
406  463  427  4253
407  427  463  4651
408  465  429  4273
409  429  465  4671
410  467  431  4293
411  431  467  4691
412  469  433  4313
413  435  471  4731
414  473  437  4353
415  437  473  4751
416  475  439  4373
417  439  475  4771
418  477  441  4393
419  441  477  4791
420  479  443  4413
421  443  479  4811
422  481  445  4433
423  445  481  4831
424  483  447  4453
425  447  483  4851
426  485  449  4473
427  449  485  4871
428  487  451  4493
429  451  487  4891
430  489  453  4513
431  453  489  4911
432  491  455  4533
433  455  491  4931
434  493  457  4553
435  457  493  4951
436  495  459  4573
437  459  495  4971
438  497  461  4593
439  461  497  4991
440  499  463  4613
441  463  499  5011
442  501  465  4633
443  465  501  5031
444  503  467  4653
```

```
 445  467  503  5051
 446  505  469  4673
 447  471  507  5091
 448  509  473  4713
 449  473  509  5111
 450  511  475  4733
 451  475  511  5131
 452  513  477  4753
 453  477  513  5151
 454  515  479  4773
 455  479  515  5171
 456  517  481  4793
 457  481  517  5191
 458  519  483  4813
 459  483  519  5211
 460  521  485  4833
 461  485  521  5231
 462  523  487  4853
 463  487  523  5251
 464  525  489  4873
 465  489  525  5271
 466  527  491  4893
 467  491  527  5291
 468  529  493  4913
 469  493  529  5311
 470  531  495  4933
 471  495  531  5331
 472  533  497  4953
 473  497  533  5351
 474  535  499  4973
 475  499  535  5371
 476  537  501  4993
 477  501  537  5391
 478  539  503  5013
 479  503  539  5411
 480  541  505  5033
   2
   4
   6
   8
  10
  12
  14
  16
  18
  20
  22
  24
  26
  28
  30
  32
  34
  36
  38
  40
  42
  44
  46
  48
  50
  52
  54
  56
  58
  60
  62
  64
```

```
68
70
72
74
76
78
80
82
84
86
88
90
92
94
96
98
```

ORIGINAL PAGE IS
OF POOR QUALITY

APPENDIX B: OUTPUT PRINTOUT FOR THE SAMPLE PROBLEM

```
C O N T R O L   I N F O R M A T I O N

    NUMBER OF NODAL POINTS   =  542
    NUMBER OF ELEMENT TYPES  =    1
    NUMBER OF LOAD CASES     =    1
    NUMBER OF FREQUENCIES    =    0
    ANALYSIS CODE (NDYN)     =    0
      EQ.0, STATIC
      EQ.1, MODAL EXTRACTION
      EQ.2, FORCED RESPONSE
      EQ.3, RESPONSE SPECTRUM
      EQ.4, DIRECT INTEGRATION
      EQ.5, FREQUENCY RESPONSE
    SOLUTION MODE (MODEX)    =    0
      EQ.0, EXECUTION
      EQ.1, DATA CHECK
    NUMBER OF SUBSPACE
    ITERATION VECTORS (NAD)  =    0
    EQUATIONS PER BLOCK      =    0
    TAPE10 SAVE FLAG (N10SV) =    1
    GRAVITATIONAL CONSTANT   =  386.40
    TOTAL BLANK COMMON (MTOT)= 9998

REQUIRED BLANK COMMON FOR THIS STEP=    5421
```

```
ELASTIC PROPERTIES
 1  1.0       1100.     330.      0.     330.    1100.      0.      0.      0.     384.     384.      0.      0.     384.
```

5(b)

```
NODAL POINT INPUT DATA

GENERATED NODAL DATA

NODE    BOUNDARY CONDITION CODES                    NODAL POINT COORDINATES
NUMBER   X     Y     Z    XX    YY    ZZ           X              Y              Z
    1    1     0     0     0     0     0        0.00000        0.09880        0.00000
    2    1     0     0     0     0     0        0.00000        0.09880        1.00000
    3    1     0     0     0     0     0        0.00000        0.10440        0.00000
    4    1     0     0     0     0     0        0.00000        0.10440        1.00000
    5    1     0     0     0     0     0        0.00000        0.11000        0.00000
    6    1     0     0     0     0     0        0.00000        0.11000        1.00000
    7    1     0     0     0     0     0        0.00000        0.12000        0.00000
    8    1     0     0     0     0     0        0.00000        0.12000        1.00000
    9    1     0     0     0     0     0        0.00000        0.13000        0.00000
   10    1     0     0     0     0     0        0.00000        0.13000        1.00000
   11    1     0     0     0     0     0        0.00000        0.14500        0.00000
   12    1     0     0     0     0     0        0.00000        0.14500        1.00000
   13    1     0     0     0     0     0        0.00000        0.16000        0.00000
   14    1     0     0     0     0     0        0.00000        0.16000        1.00000
   15    1     0     0     0     0     0        0.00000        0.18000        0.00000
   16    1     0     0     0     0     0        0.00000        0.18000        1.00000
   17    1     1     1     0     0     0        0.00000        0.20000        0.00000
   18    1     1     1     0     0     0        0.00000        0.20000        1.00000
   19    0     0     0     0     0     0        1.56000        0.09880        0.00000
   20    0     0     0     0     0     0        1.56000        0.09880        1.00000
   21    0     0     0     0     0     0        1.56000        0.10440        0.00000
   22    0     0     0     0     0     0        1.56000        0.10440        1.00000
   23    0     0     0     0     0     0        1.56000        0.11000        0.00000
   24    0     0     0     0     0     0        1.56000        0.11000        1.00000
   25    0     0     0     0     0     0        1.56000        0.12000        0.00000
   26    0     0     0     0     0     0        1.56000        0.12000        1.00000
   27    0     0     0     0     0     0        1.56000        0.13000        0.00000
   28    0     0     0     0     0     0        1.56000        0.13000        1.00000
   29    0     0     0     0     0     0        1.56000        0.14500        0.00000
   30    0     0     0     0     0     0        1.56000        0.14500        1.00000
   31    0     0     0     0     0     0        1.56000        0.16000        0.00000
   32    0     0     0     0     0     0        1.56000        0.16000        1.00000
   33    0     0     0     0     0     0        1.56000        0.18000        0.00000
   34    0     0     0     0     0     0        1.56000        0.18000        1.00000
   35    1     1     1     0     0     0        1.56000        0.20000        0.00000
   36    1     1     1     0     0     0        1.56000        0.20000        1.00000
   37    0     0     0     0     0     0        3.09000        0.09510        0.00000
   38    0     0     0     0     0     0        3.09000        0.09510        1.00000
   39    0     0     0     0     0     0        3.09000        0.09880        0.00000
   40    0     0     0     0     0     0        3.09000        0.09880        1.00000
   41    0     0     0     0     0     0        3.09000        0.10440        0.00000
   42    0     0     0     0     0     0        3.09000        0.10440        1.00000
   43    0     0     0     0     0     0        3.09000        0.11000        0.00000
   44    0     0     0     0     0     0        3.09000        0.11000        1.00000
   45    0     0     0     0     0     0        3.09000        0.12000        0.00000
   46    0     0     0     0     0     0        3.09000        0.12000        1.00000
   47    0     0     0     0     0     0        3.09000        0.13000        0.00000
   48    0     0     0     0     0     0        3.09000        0.13000        1.00000
   49    0     0     0     0     0     0        3.09000        0.14500        0.00000
   50    0     0     0     0     0     0        3.09000        0.14500        1.00000
   51    0     0     0     0     0     0        3.09000        0.16000        0.00000
   52    0     0     0     0     0     0        3.09000        0.16000        1.00000
   53    0     0     0     0     0     0        3.09000        0.18000        0.00000
   54    0     0     0     0     0     0        3.09000        0.18000        1.00000
   55    1     1     1     0     0     0        3.09000        0.20000        0.00000
   56    1     1     1     0     0     0        3.09000        0.20000        1.00000
   57    0     0     0     0     0     0        4.54000        0.08910        0.00000
   58    0     0     0     0     0     0        4.54000        0.08910        1.00000
```

ORIGINAL PAGE IS
OF POOR QUALITY

196

```
 59    0    0    0    0    0    0    4.54000    0.09510    0.00000
 60    0    0    0    0    0    0    4.54000    0.09510    1.00000
 61    0    0    0    0    0    0    4.54000    0.09880    0.00000
 62    0    0    0    0    0    0    4.54000    0.09880    1.00000
 63    0    0    0    0    0    0    4.54000    0.10440    0.00000
 64    0    0    0    0    0    0    4.54000    0.10440    1.00000
 65    0    0    0    0    0    0    4.54000    0.11000    0.00000
 66    0    0    0    0    0    0    4.54000    0.11000    1.00000
 67    0    0    0    0    0    0    4.54000    0.12000    0.00000
 68    0    0    0    0    0    0    4.54000    0.12000    1.00000
 69    0    0    0    0    0    0    4.54000    0.13000    0.00000
 70    0    0    0    0    0    0    4.54000    0.13000    1.00000
 71    0    0    0    0    0    0    4.54000    0.14500    0.00000
 72    0    0    0    0    0    0    4.54000    0.14500    1.00000
 73    0    0    0    0    0    0    4.54000    0.16000    0.00000
 74    0    0    0    0    0    0    4.54000    0.16000    1.00000
 75    0    0    0    0    0    0    4.54000    0.18000    0.00000
 76    0    0    0    0    0    0    4.54000    0.18000    1.00000
 77    1    1    1    0    0    0    4.54000    0.20000    0.00000
 78    1    1    1    0    0    0    4.54000    0.20000    1.00000
 79    0    0    0    0    0    0    5.88000    0.08090    0.00000
 80    0    0    0    0    0    0    5.88000    0.08090    1.00000
 81    0    0    0    0    0    0    5.88000    0.08910    0.00000
 82    0    0    0    0    0    0    5.88000    0.08910    1.00000
 83    0    0    0    0    0    0    5.88000    0.09510    0.00000
 84    0    0    0    0    0    0    5.88000    0.09510    1.00000
 85    0    0    0    0    0    0    5.88000    0.09880    0.00000
 86    0    0    0    0    0    0    5.88000    0.09880    1.00000
 87    0    0    0    0    0    0    5.88000    0.10440    0.00000
 88    0    0    0    0    0    0    5.88000    0.10440    1.00000
 89    0    0    0    0    0    0    5.88000    0.11000    0.00000
 90    0    0    0    0    0    0    5.88000    0.11000    1.00000
 91    0    0    0    0    0    0    5.88000    0.12000    0.00000
 92    0    0    0    0    0    0    5.88000    0.12000    1.00000
 93    0    0    0    0    0    0    5.88000    0.13000    0.00000
 94    0    0    0    0    0    0    5.88000    0.13000    1.00000
 95    0    0    0    0    0    0    5.88000    0.14500    0.00000
 96    0    0    0    0    0    0    5.88000    0.14500    1.00000
 97    0    0    0    0    0    0    5.88000    0.16000    0.00000
 98    0    0    0    0    0    0    5.88000    0.16000    1.00000
 99    0    0    0    0    0    0    5.88000    0.18000    0.00000
100    0    0    0    0    0    0    5.88000    0.18000    1.00000
101    1    1    1    0    0    0    5.88000    0.20000    0.00000
102    1    1    1    0    0    0    5.88000    0.20000    1.00000
103    0    0    0    0    0    0    7.07000    0.07070    0.00000
104    0    0    0    0    0    0    7.07000    0.07070    1.00000
105    0    0    0    0    0    0    7.07000    0.08090    0.00000
106    0    0    0    0    0    0    7.07000    0.08090    1.00000
107    0    0    0    0    0    0    7.07000    0.08910    0.00000
108    0    0    0    0    0    0    7.07000    0.08910    1.00000
109    0    0    0    0    0    0    7.07000    0.09510    0.00000
110    0    0    0    0    0    0    7.07000    0.09510    1.00000
111    0    0    0    0    0    0    7.07000    0.09880    0.00000
112    0    0    0    0    0    0    7.07000    0.09880    1.00000
113    0    0    0    0    0    0    7.07000    0.10440    0.00000
114    0    0    0    0    0    0    7.07000    0.10440    1.00000
115    0    0    0    0    0    0    7.07000    0.11000    0.00000
116    0    0    0    0    0    0    7.07000    0.11000    1.00000
117    0    0    0    0    0    0    7.07000    0.12000    0.00000
118    0    0    0    0    0    0    7.07000    0.12000    1.00000
119    0    0    0    0    0    0    7.07000    0.13000    0.00000
120    0    0    0    0    0    0    7.07000    0.13000    1.00000
121    0    0    0    0    0    0    7.07000    0.14500    0.00000
122    0    0    0    0    0    0    7.07000    0.14500    1.00000
123    0    0    0    0    0    0    7.07000    0.16000    0.00000
124    0    0    0    0    0    0    7.07000    0.16000    1.00000
125    0    0    0    0    0    0    7.07000    0.18000    0.00000
126    0    0    0    0    0    0    7.07000    0.18000    1.00000
```

```
127   1   1   1   0   0   0   7.07000   0.20000   0.00000
128   1   1   1   0   0   0   7.07000   0.20000   1.00000
129   0   0   0   0   0   0   8.09000   0.05880   0.00000
130   0   0   0   0   0   0   8.09000   0.05880   1.00000
131   0   0   0   0   0   0   8.09000   0.07070   0.00000
132   0   0   0   0   0   0   8.09000   0.07070   1.00000
133   0   0   0   0   0   0   8.09000   0.08090   0.00000
134   0   0   0   0   0   0   8.09000   0.08090   1.00000
135   0   0   0   0   0   0   8.09000   0.08910   0.00000
136   0   0   0   0   0   0   8.09000   0.08910   1.00000
137   0   0   0   0   0   0   8.09000   0.09510   0.00000
138   0   0   0   0   0   0   8.09000   0.09510   1.00000
139   0   0   0   0   0   0   8.09000   0.09880   0.00000
140   0   0   0   0   0   0   8.09000   0.09880   1.00000
141   0   0   0   0   0   0   8.09000   0.10440   0.00000
142   0   0   0   0   0   0   8.09000   0.10440   1.00000
143   0   0   0   0   0   0   8.09000   0.11000   0.00000
144   0   0   0   0   0   0   8.09000   0.11000   1.00000
145   0   0   0   0   0   0   8.09000   0.12000   0.00000
146   0   0   0   0   0   0   8.09000   0.12000   1.00000
147   0   0   0   0   0   0   8.09000   0.13000   0.00000
148   0   0   0   0   0   0   8.09000   0.13000   1.00000
149   0   0   0   0   0   0   8.09000   0.14500   0.00000
150   0   0   0   0   0   0   8.09000   0.14500   1.00000
151   0   0   0   0   0   0   8.09000   0.16000   0.00000
152   0   0   0   0   0   0   8.09000   0.16000   1.00000
153   0   0   0   0   0   0   8.09000   0.18000   0.00000
154   0   0   0   0   0   0   8.09000   0.18000   1.00000
155   1   1   1   0   0   0   8.09000   0.20000   0.00000
156   1   1   1   0   0   0   8.09000   0.20000   1.00000
157   0   0   0   0   0   0   8.91000   0.04540   0.00000
158   0   0   0   0   0   0   8.91000   0.04540   1.00000
159   0   0   0   0   0   0   8.91000   0.05880   0.00000
160   0   0   0   0   0   0   8.91000   0.05880   1.00000
161   0   0   0   0   0   0   8.91000   0.07070   0.00000
162   0   0   0   0   0   0   8.91000   0.07070   1.00000
163   0   0   0   0   0   0   8.91000   0.08090   0.00000
164   0   0   0   0   0   0   8.91000   0.08090   1.00000
165   0   0   0   0   0   0   8.91000   0.08910   0.00000
166   0   0   0   0   0   0   8.91000   0.08910   1.00000
167   0   0   0   0   0   0   8.91000   0.09510   0.00000
168   0   0   0   0   0   0   8.91000   0.09510   1.00000
169   0   0   0   0   0   0   8.91000   0.09880   0.00000
170   0   0   0   0   0   0   8.91000   0.09880   1.00000
171   0   0   0   0   0   0   8.91000   0.10440   0.00000
172   0   0   0   0   0   0   8.91000   0.10440   1.00000
173   0   0   0   0   0   0   8.91000   0.11000   0.00000
174   0   0   0   0   0   0   8.91000   0.11000   1.00000
175   0   0   0   0   0   0   8.91000   0.12000   0.00000
176   0   0   0   0   0   0   8.91000   0.12000   1.00000
177   0   0   0   0   0   0   8.91000   0.13000   0.00000
178   0   0   0   0   0   0   8.91000   0.13000   1.00000
179   0   0   0   0   0   0   8.91000   0.14500   0.00000
180   0   0   0   0   0   0   8.91000   0.14500   1.00000
181   0   0   0   0   0   0   8.91000   0.16000   0.00000
182   0   0   0   0   0   0   8.91000   0.16000   1.00000
183   0   0   0   0   0   0   8.91000   0.18000   0.00000
184   0   0   0   0   0   0   8.91000   0.18000   1.00000
185   1   1   1   0   0   0   8.91000   0.20000   0.00000
186   1   1   1   0   0   0   8.91000   0.20000   1.00000
187   0   0   0   0   0   0   9.51000   0.03090   0.00000
188   0   0   0   0   0   0   9.51000   0.03090   1.00000
189   0   0   0   0   0   0   9.51000   0.04540   0.00000
190   0   0   0   0   0   0   9.51000   0.04540   1.00000
191   0   0   0   0   0   0   9.51000   0.05880   0.00000
192   0   0   0   0   0   0   9.51000   0.05880   1.00000
193   0   0   0   0   0   0   9.51000   0.07070   0.00000
194   0   0   0   0   0   0   9.51000   0.07070   1.00000
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
196   0   0   0   0   0   0    9.51000    0.08090    1.00000
197   0   0   0   0   0   0    9.51000    0.08910    0.00000
198   0   0   0   0   0   0    9.51000    0.08910    1.00000
199   0   0   0   0   0   0    9.51000    0.09510    0.00000
200   0   0   0   0   0   0    9.51000    0.09510    1.00000
201   0   0   0   0   0   0    9.51000    0.09880    0.00000
202   0   0   0   0   0   0    9.51000    0.09880    1.00000
203   0   0   0   0   0   0    9.51000    0.10440    0.00000
204   0   0   0   0   0   0    9.51000    0.10440    1.00000
205   0   0   0   0   0   0    9.51000    0.11000    0.00000
206   0   0   0   0   0   0    9.51000    0.11000    1.00000
207   0   0   0   0   0   0    9.51000    0.12000    0.00000
208   0   0   0   0   0   0    9.51000    0.12000    1.00000
209   0   0   0   0   0   0    9.51000    0.13000    0.00000
210   0   0   0   0   0   0    9.51000    0.13000    1.00000
211   0   0   0   0   0   0    9.51000    0.14500    0.00000
212   0   0   0   0   0   0    9.51000    0.14500    1.00000
213   0   0   0   0   0   0    9.51000    0.16000    0.00000
214   0   0   0   0   0   0    9.51000    0.16000    1.00000
215   0   0   0   0   0   0    9.51000    0.18000    0.00000
216   0   0   0   0   0   0    9.51000    0.18000    1.00000
217   1   1   1   0   0   0    9.51000    0.20000    0.00000
218   1   1   1   0   0   0    9.51000    0.20000    1.00000
219   0   1   0   0   0   0    9.88000    0.00000    0.00000
220   0   1   0   0   0   0    9.88000    0.00000    1.00000
221   0   0   0   0   0   0    9.88000    0.01560    0.00000
222   0   0   0   0   0   0    9.88000    0.01560    1.00000
223   0   0   0   0   0   0    9.88000    0.03090    0.00000
224   0   0   0   0   0   0    9.88000    0.03090    1.00000
225   0   0   0   0   0   0    9.88000    0.04540    0.00000
226   0   0   0   0   0   0    9.88000    0.04540    1.00000
227   0   0   0   0   0   0    9.88000    0.05880    0.00000
228   0   0   0   0   0   0    9.88000    0.05880    1.00000
229   0   0   0   0   0   0    9.88000    0.07070    0.00000
230   0   0   0   0   0   0    9.88000    0.07070    1.00000
231   0   0   0   0   0   0    9.88000    0.08090    0.00000
232   0   0   0   0   0   0    9.88000    0.08090    1.00000
233   0   0   0   0   0   0    9.88000    0.08910    0.00000
234   0   0   0   0   0   0    9.88000    0.08910    1.00000
235   0   0   0   0   0   0    9.88000    0.09510    0.00000
236   0   0   0   0   0   0    9.88000    0.09510    1.00000
237   0   0   0   0   0   0    9.88000    0.09880    0.00000
238   0   0   0   0   0   0    9.88000    0.09880    1.00000
239   0   0   0   0   0   0    9.88000    0.10440    0.00000
240   0   0   0   0   0   0    9.88000    0.10440    1.00000
241   0   0   0   0   0   0    9.88000    0.11000    0.00000
242   0   0   0   0   0   0    9.88000    0.11000    1.00000
243   0   0   0   0   0   0    9.88000    0.12000    0.00000
244   0   0   0   0   0   0    9.88000    0.12000    1.00000
245   0   0   0   0   0   0    9.88000    0.13000    0.00000
246   0   0   0   0   0   0    9.88000    0.13000    1.00000
247   0   0   0   0   0   0    9.88000    0.14500    0.00000
248   0   0   0   0   0   0    9.88000    0.14500    1.00000
249   0   0   0   0   0   0    9.88000    0.16000    0.00000
250   0   0   0   0   0   0    9.88000    0.16000    1.00000
251   0   0   0   0   0   0    9.88000    0.18000    0.00000
252   0   0   0   0   0   0    9.88000    0.18000    1.00000
253   1   1   1   0   0   0    9.88000    0.20000    0.00000
254   1   1   1   0   0   0    9.88000    0.20000    1.00000
255   0   1   0   0   0   0   10.44000    0.00000    0.00000
256   0   1   0   0   0   0   10.44000    0.00000    1.00000
257   0   0   0   0   0   0   10.44000    0.01560    0.00000
258   0   0   0   0   0   0   10.44000    0.01560    1.00000
259   0   0   0   0   0   0   10.44000    0.03090    0.00000
260   0   0   0   0   0   0   10.44000    0.03090    1.00000
261   0   0   0   0   0   0   10.44000    0.04540    0.00000
262   0   0   0   0   0   0   10.44000    0.04540    1.00000
```

```
263    0    0    0    0    0    0    10.44000    0.05880    0.00000
264    0    0    0    0    0    0    10.44000    0.05880    1.00000
265    0    0    0    0    0    0    10.44000    0.07070    0.00000
266    0    0    0    0    0    0    10.44000    0.07070    1.00000
267    0    0    0    0    0    0    10.44000    0.08090    0.00000
268    0    0    0    0    0    0    10.44000    0.08090    1.00000
269    0    0    0    0    0    0    10.44000    0.08910    0.00000
270    0    0    0    0    0    0    10.44000    0.08910    1.00000
271    0    0    0    0    0    0    10.44000    0.09510    0.00000
272    0    0    0    0    0    0    10.44000    0.09510    1.00000
273    0    0    0    0    0    0    10.44000    0.09880    0.00000
274    0    0    0    0    0    0    10.44000    0.09880    1.00000
275    0    0    0    0    0    0    10.44000    0.10440    0.00000
276    0    0    0    0    0    0    10.44000    0.10440    1.00000
277    0    0    0    0    0    0    10.44000    0.11000    0.00000
278    0    0    0    0    0    0    10.44000    0.11000    1.00000
279    0    0    0    0    0    0    10.44000    0.12000    0.00000
280    0    0    0    0    0    0    10.44000    0.12000    1.00000
281    0    0    0    0    0    0    10.44000    0.13000    0.00000
282    0    0    0    0    0    0    10.44000    0.13000    1.00000
283    0    0    0    0    0    0    10.44000    0.14500    0.00000
284    0    0    0    0    0    0    10.44000    0.14500    1.00000
285    0    0    0    0    0    0    10.44000    0.16000    0.00000
286    0    0    0    0    0    0    10.44000    0.16000    1.00000
287    0    0    0    0    0    0    10.44000    0.18000    0.00000
288    0    0    0    0    0    0    10.44000    0.18000    1.00000
289    1    1    1    0    0    0    10.44000    0.20000    0.00000
290    1    1    1    0    0    0    10.44000    0.20000    1.00000
291    0    1    0    0    0    0    11.00000    0.00000    0.00000
292    0    1    0    0    0    0    11.00000    0.00000    1.00000
293    0    0    0    0    0    0    11.00000    0.01560    0.00000
294    0    0    0    0    0    0    11.00000    0.01560    1.00000
295    0    0    0    0    0    0    11.00000    0.03090    0.00000
296    0    0    0    0    0    0    11.00000    0.03090    1.00000
297    0    0    0    0    0    0    11.00000    0.04540    0.00000
298    0    0    0    0    0    0    11.00000    0.04540    1.00000
299    0    0    0    0    0    0    11.00000    0.05880    0.00000
300    0    0    0    0    0    0    11.00000    0.05880    1.00000
301    0    0    0    0    0    0    11.00000    0.07070    0.00000
302    0    0    0    0    0    0    11.00000    0.07070    1.00000
303    0    0    0    0    0    0    11.00000    0.08090    0.00000
304    0    0    0    0    0    0    11.00000    0.08090    1.00000
305    0    0    0    0    0    0    11.00000    0.08910    0.00000
306    0    0    0    0    0    0    11.00000    0.08910    1.00000
307    0    0    0    0    0    0    11.00000    0.09510    0.00000
308    0    0    0    0    0    0    11.00000    0.09510    1.00000
309    0    0    0    0    0    0    11.00000    0.09880    0.00000
310    0    0    0    0    0    0    11.00000    0.09880    1.00000
311    0    0    0    0    0    0    11.00000    0.10440    0.00000
312    0    0    0    0    0    0    11.00000    0.10440    1.00000
313    0    0    0    0    0    0    11.00000    0.11000    0.00000
314    0    0    0    0    0    0    11.00000    0.11000    1.00000
315    0    0    0    0    0    0    11.00000    0.12000    0.00000
316    0    0    0    0    0    0    11.00000    0.12000    1.00000
317    0    0    0    0    0    0    11.00000    0.13000    0.00000
318    0    0    0    0    0    0    11.00000    0.13000    1.00000
319    0    0    0    0    0    0    11.00000    0.14500    0.00000
320    0    0    0    0    0    0    11.00000    0.14500    1.00000
321    0    0    0    0    0    0    11.00000    0.16000    0.00000
322    0    0    0    0    0    0    11.00000    0.16000    1.00000
323    0    0    0    0    0    0    11.00000    0.18000    0.00000
324    0    0    0    0    0    0    11.00000    0.18000    1.00000
325    1    1    1    0    0    0    11.00000    0.20000    0.00000
326    1    1    1    0    0    0    11.00000    0.20000    1.00000
327    0    1    0    0    0    0    12.00000    0.00000    0.00000
328    0    1    0    0    0    0    12.00000    0.00000    1.00000
329    0    0    0    0    0    0    12.00000    0.01560    0.00000
330    0    0    0    0    0    0    12.00000    0.01560    1.00000
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
331   0   0   0   0   0   0   12.00000   0.03090   0.00000
332   0   0   0   0   0   0   12.00000   0.03090   1.00000
333   0   0   0   0   0   0   12.00000   0.04540   0.00000
334   0   0   0   0   0   0   12.00000   0.04540   1.00000
335   0   0   0   0   0   0   12.00000   0.05880   0.00000
336   0   0   0   0   0   0   12.00000   0.05880   1.00000
337   0   0   0   0   0   0   12.00000   0.07070   0.00000
338   0   0   0   0   0   0   12.00000   0.07070   1.00000
339   0   0   0   0   0   0   12.00000   0.08090   0.00000
340   0   0   0   0   0   0   12.00000   0.08090   1.00000
341   0   0   0   0   0   0   12.00000   0.08910   0.00000
342   0   0   0   0   0   0   12.00000   0.08910   1.00000
343   0   0   0   0   0   0   12.00000   0.09510   0.00000
344   0   0   0   0   0   0   12.00000   0.09510   1.00000
345   0   0   0   0   0   0   12.00000   0.09880   0.00000
346   0   0   0   0   0   0   12.00000   0.09880   1.00000
347   0   0   0   0   0   0   12.00000   0.10440   0.00000
348   0   0   0   0   0   0   12.00000   0.10440   1.00000
349   0   0   0   0   0   0   12.00000   0.11000   0.00000
350   0   0   0   0   0   0   12.00000   0.11000   1.00000
351   0   0   0   0   0   0   12.00000   0.12000   0.00000
352   0   0   0   0   0   0   12.00000   0.12000   1.00000
353   0   0   0   0   0   0   12.00000   0.13000   0.00000
354   0   0   0   0   0   0   12.00000   0.13000   1.00000
355   0   0   0   0   0   0   12.00000   0.14500   0.00900
356   0   0   0   0   0   0   12.00000   0.14500   1.00000
357   0   0   0   0   0   0   12.00000   0.16000   0.00000
358   0   0   0   0   0   0   12.00000   0.16000   1.00000
359   0   0   0   0   0   0   12.00000   0.18000   0.00000
360   0   0   0   0   0   0   12.00000   0.18000   1.00000
361   1   1   1   0   0   0   12.00000   0.20000   0.00000
362   1   1   1   0   0   0   12.00000   0.20000   1.00000
363   0   1   0   0   0   0   13.00000   0.00000   0.00000
364   0   1   0   0   0   0   13.00000   0.00000   1.00000
365   0   0   0   0   0   0   13.00000   0.01560   0.00000
366   0   0   0   0   0       13.00000   0.01560   1.00000
367   0   0   0   0   0   0   13.00000   0.03090   0.00000
368   0   0   0   0   0   0   13.00000   0.03090   1.00000
369   0   0   0   0   0   0   13.00000   0.04540   0.00000
370   0   0   0   0   0   0   13.00000   0.04540   1.00000
371   0   0   0   0   0   0   13.00000   0.05880   0.00000
372   0   0   0   0   0   0   13.00000   0.05889   1.00000
373   0   0   0   0   0   0   13.00000   0.07070   0.00000
374   0   0   0   0   0   0   13.00000   0.07070   1.00000
375   0   0   0   0   0   0   13.00000   0.08090   0.00000
376   0   0   0   0   0   0   13.00000   0.08090   1.00000
377   0   0   0   0   0   0   13.00000   0.08910   0.00000
378   0   0   0   0   0   0   13.00000   0.08910   1.00000
379   0   0   0   0   0   0   13.00000   0.09510   0.00000
380   0   0   0   0   0   0   13.00000   0.09510   1.00000
381   0   0   0   0   0   0   13.00000   0.09880   0.00000
382   0   0   0   0   0   0   13.00000   0.09880   1.00000
383   0   0   0   0   0   0   13.00000   0.10440   0.00000
384   0   0   0   0   0   0   13.00000   0.10440   1.00000
385   0   0   0   0   0   0   13.00000   0.11000   0.00000
386   0   0   0   0   0   0   13.00000   0.11000   1.00000
387   0   0   0   0   0   0   13.00000   0.12000   0.00000
388   0   0   0   0   0   0   13.00000   0.12000   1.00000
389   0   0   0   0   0   0   13.00000   0.13000   0.00000
390   0   0   0   0   0   0   13.00000   0.13000   1.00000
391   0   0   0   0   0   0   13.00000   0.14500   0.00000
392   0   0   0   0   0   0   13.00000   0.14500   1.00000
393   0   0   0   0   0   0   13.00000   0.16000   0.00000
394   0   0   0   0   0   0   13.00000   0.16000   1.00000
395   0   0   0   0   0   0   13.00000   0.18000   0.00000
396   0   0   0   0   0   0   13.00000   0.18000   1.00000
397   1   1   1   0   0   0   13.00000   0.20000   0.00000
398   1   1   1   0   0   0   13.00000   0.20000   1.00000
```

```
 399     0     1     0     0     0     0     14.50000     0.00000     0.00000
 400     0     1     0     0     0     0     14.50000     0.00000     1.00000
 401     0     0     0     0     0     0     14.50000     0.01560     0.00000
 402     0     0     0     0     0     0     14.50000     0.01560     1.00000
 403     0     0     0     0     0     0     14.50000     0.03090     0.00000
 404     0     0     0     0     0     0     14.50000     0.03090     1.00000
 405     0     0     0     0     0     0     14.50000     0.04540     0.00000
 406     0     0     0     0     0     0     14.50000     0.04540     1.00000
 407     0     0     0     0     0     0     14.50000     0.05880     0.00000
 408     0     0     0     0     0     0     14.50000     0.05880     1.00000
 409     0     0     0     0     0     0     14.50000     0.07070     0.00000
 410     0     0     0     0     0     0     14.50000     0.07070     1.00000
 411     0     0     0     0     0     0     14.50000     0.08090     0.00000
 412     0     0     0     0     0     0     14.50000     0.08090     1.00000
 413     0     0     0     0     0     0     14.50000     0.08910     0.00000
 414     0     0     0     0     0     0     14.50000     0.08910     1.00000
 415     0     0     0     0     0     0     14.50000     0.09510     0.00000
 416     0     0     0     0     0     0     14.50000     0.09510     1.00000
 417     0     0     0     0     0     0     14.50000     0.09880     0.00000
 418     0     0     0     0     0     0     14.50000     0.09880     1.00000
 419     0     0     0     0     0     0     14.50000     0.10440     0.00000
 420     0     0     0     0     0     0     14.50000     0.10440     1.00000
 421     0     0     0     0     0     0     14.50000     0.11000     0.00000
 422     0     0     0     0     0     0     14.50000     0.11000     1.00000
 423     0     0     0     0     0     0     14.50000     0.12000     0.00000
 424     0     0     0     0     0     0     14.50000     0.12000     1.00000
 425     0     0     0     0     0     0     14.50000     0.13000     0.00000
 426     0     0     0     0     0     0     14.50000     0.13000     1.00000
 427     0     0     0     0     0     0     14.50000     0.14500     0.00000
 428     0     0     0     0     0     0     14.50000     0.14500     1.00000
 429     0     0     0     0     0     0     14.50000     0.16000     0.00000
 430     0     0     0     0     0     0     14.50000     0.16000     1.00000
 431     0     0     0     0     0     0     14.50000     0.18000     0.00000
 432     0     0     0     0     0     0     14.50000     0.18000     1.00000
 433     1     1     1     0     0     0     14.50000     0.20000     0.00000
 434     1     1     1     0     0     0     14.50000     0.20000     1.00000
 435     0     1     0     0     0     0     16.00000     0.00000     0.00000
 436     0     1     0     0     0     0     16.00000     0.00000     1.00000
 437     0     0     0     0     0     0     16.00000     0.01560     0.00000
 438     0     0     0     0     0     0     16.00000     0.01560     1.00000
 439     0     0     0     0     0     0     16.00000     0.03090     0.00000
 440     0     0     0     0     0     0     16.00000     0.03090     1.00000
 441     0     0     0     0     0     0     16.00000     0.04540     0.00000
 442     0     0     0     0     0     0     16.00000     0.04540     1.00000
 443     0     0     0     0     0     0     16.00000     0.05880     0.00000
 444     0     0     0     0     0     0     16.00000     0.05880     1.00000
 445     0     0     0     0     0     0     16.00000     0.07070     0.00000
 446     0     0     0     0     0     0     16.00000     0.07070     1.00000
 447     0     0     0     0     0     0     16.00000     0.08090     0.00000
 448     0     0     0     0     0     0     16.00000     0.08090     1.00000
 449     0     0     0     0     0     0     16.00000     0.08910     0.00000
 450     0     0     0     0     0     0     16.00000     0.08910     1.00000
 451     0     0     0     0     0     0     16.00000     0.09510     0.00000
 452     0     0     0     0     0     0     16.00000     0.09510     1.00000
 453     0     0     0     0     0     0     16.00000     0.09880     0.00000
 454     0     0     0     0     0     0     16.00000     0.09880     1.00000
 455     0     0     0     0     0     0     16.00000     0.10440     0.00000
 456     0     0     0     0     0     0     16.00000     0.10440     1.00000
 457     0     0     0     0     0     0     16.00000     0.11000     0.00000
 458     0     0     0     0     0     0     16.00000     0.11000     1.00000
 459     0     0     0     0     0     0     16.00000     0.12000     0.00000
 460     0     0     0     0     0     0     16.00000     0.12000     1.00000
 461     0     0     0     0     0     0     16.00000     0.13000     0.00000
 462     0     0     0     0     0     0     16.00000     0.13000     1.00000
 463     0     0     0     0     0     0     16.00000     0.14500     0.00000
 464     0     0     0     0     0     0     16.00000     0.14500     1.00000
 465     0     0     0     0     0     0     16.00000     0.16000     0.00000
 466     0     0     0     0     0     0     16.00000     0.16000     1.00000
 467     0     0     0     0     0     0     16.00000     0.16000     0.00000
```

```
468  0  0  0  0  0  0  16.00000  0.18000  1.00000
469  1  1  1  0  0  0  16.00000  0.20000  0.00000
470  1  1  1  0  0  0  16.00000  0.20000  1.00000
471  0  1  0  0  0  0  18.00000  0.00000  0.00000
472  0  1  0  0  0  0  18.00000  0.00000  1.00000
473  0  0  0  0  0  0  18.00000  0.01560  0.00000
474  0  0  0  0  0  0  18.00000  0.01560  1.00000
475  0  0  0  0  0  0  18.00000  0.03090  0.00000
476  0  0  0  0  0  0  18.00000  0.03090  1.00000
477  0  0  0  0  0  0  18.00000  0.04540  0.00000
478  0  0  0  0  0  0  18.00000  0.04540  1.00000
479  0  0  0  0  0  0  18.00000  0.05880  0.00000
480  0  0  0  0  0  0  18.00000  0.05880  1.00000
481  0  0  0  0  0  0  18.00000  0.07070  0.00000
482  0  0  0  0  0  0  18.00000  0.07070  1.00000
483  0  0  0  0  0  0  18.00000  0.08090  0.00000
484  0  0  0  0  0  0  18.00000  0.08090  1.00000
485  0  0  0  0  0  0  18.00000  0.08910  0.00000
486  0  0  0  0  0  0  18.00000  0.08910  1.00000
487  0  0  0  0  0  0  18.00000  0.09510  0.00000
488  0  0  0  0  0  0  18.00000  0.09510  1.00000
489  0  0  0  0  0  0  18.00000  0.09880  0.00000
490  0  0  0  0  0  0  18.00000  0.09880  1.00000
491  0  0  0  0  0  0  18.00000  0.10440  0.00000
492  0  0  0  0  0  0  18.00000  0.10440  1.00000
493  0  0  0  0  0  0  18.00000  0.11000  0.00000
494  0  0  0  0  0  0  18.00000  0.11000  1.00000
495  0  0  0  0  0  0  18.00000  0.12000  0.00000
496  0  0  0  0  0  0  18.00000  0.12000  1.00000
497  0  0  0  0  0  0  18.00000  0.13000  0.00000
498  0  0  0  0  0  0  18.00000  0.13000  1.00000
499  0  0  0  0  0  0  18.00000  0.14500  0.00000
500  0  0  0  0  0  0  18.00000  0.14500  1.00000
501  0  0  0  0  0  0  18.00000  0.16000  0.00000
502  0  0  0  0  0  0  18.00000  0.16000  1.00000
503  0  0  0  0  0  0  18.00000  0.18000  0.00000
504  0  0  0  0  0  0  18.00000  0.18000  1.00000
505  1  1  1  0  0  0  18.00000  0.20000  0.00000
506  1  1  1  0  0  0  18.00000  0.20000  1.00000
507  1  1  1  0  0  0  20.00000  0.00000  0.00000
508  1  1  1  0  0  0  20.00000  0.00000  1.00000
509  1  1  1  0  0  0  20.00000  0.01560  0.00000
510  1  1  1  0  0  0  20.00000  0.01560  1.00000
511  1  1  1  0  0  0  20.00000  0.03090  0.00000
512  1  1  1  0  0  0  20.00000  0.03090  1.00000
513  1  1  1  0  0  0  20.00000  0.04540  0.00000
514  1  1  1  0  0  0  20.00000  0.04540  1.00000
515  1  1  1  0  0  0  20.00000  0.05880  0.00000
516  1  1  1  0  0  0  20.00000  0.05880  1.00000
517  1  1  1  0  0  0  20.00000  0.07070  0.00000
518  1  1  1  0  0  0  20.00000  0.07070  1.00000
519  1  1  1  0  0  0  20.00000  0.08090  0.00000
520  1  1  1  0  0  0  20.00000  0.08090  1.00000
521  1  1  1  0  0  0  20.00000  0.08910  0.00000
522  1  1  1  0  0  0  20.00000  0.08910  1.00000
523  1  1  1  0  0  0  20.00000  0.09510  0.00000
524  1  1  1  0  0  0  20.00000  0.09510  1.00000
525  1  1  1  0  0  0  20.00000  0.09880  0.00000
526  1  1  1  0  0  0  20.00000  0.09880  1.00000
527  1  1  1  0  0  0  20.00000  0.10440  0.00000
528  1  1  1  0  0  0  20.00000  0.10440  1.00000
529  1  1  1  0  0  0  20.00000  0.11000  0.00000
530  1  1  1  0  0  0  20.00000  0.11000  1.00000
531  1  1  1  0  0  0  20.00000  0.12000  0.00000
532  1  1  1  0  0  0  20.00000  0.12000  1.00000
533  1  1  1  0  0  0  20.00000  0.13000  0.00000
534  1  1  1  0  0  0  20.00000  0.13000  1.00000
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
  535     1     1     1     0     0     0     20.00000     0.14500     0.00000
  536     1     1     1     0     0     0     20.00000     0.14500     1.00000
  537     1     1     1     0     0     0     20.00000     0.16000     0.00000
  538     1     1     1     0     0     0     20.00000     0.16000     1.00000
  539     1     1     1     0     0     0     20.00000     0.18000     0.00000
  540     1     1     1     0     0     0     20.00000     0.18000     1.00000
  541     1     1     1     0     0     0     20.00000     0.20000     0.00000
  542     1     1     1     0     0     0     20.00000     0.20000     1.00000
```

```
EQUATION NUMBERS
   N     X     Y     Z    XX    YY    ZZ
   1     0     1     3     0     0     0
   2     0     2     3     0     0     0
   3     0     4     6     0     0     0
   4     0     5     6     0     0     0
   5     0     7     9     0     0     0
   6     0     8     9     0     0     0
   7     0    10    12     0     0     0
   8     0    11    12     0     0     0
   9     0    13    15     0     0     0
  10     0    14    15     0     0     0
  11     0    16    18     0     0     0
  12     0    17    18     0     0     0
  13     0    19    21     0     0     0
  14     0    20    21     0     0     0
  15     0    22    24     0     0     0
  16     0    23    24     0     0     0
  17     0     0     0     0     0     0
  18     0     0     0     0     0     0
  19    25    26    29     0     0     0
  20    27    28    29     0     0     0
  21    30    31    34     0     0     0
  22    32    33    34     0     0     0
  23    35    36    39     0     0     0
  24    37    38    39     0     0     0
  25    40    41    44     0     0     0
  26    42    43    44     0     0     0
  27    45    46    49     0     0     0
  28    47    48    49     0     0     0
  29    50    51    54     0     0     0
  30    52    53    54     0     0     0
  31    55    56    59     0     0     0
  32    57    58    59     0     0     0
  33    60    61    64     0     0     0
  34    62    63    64     0     0     0
  35     0     0     0     0     0     0
  36     0     0     0     0     0     0
  37    65    66    69     0     0     0
  38    67    68    69     0     0     0
  39    70    71    74     0     0     0
  40    72    73    74     0     0     0
  41    75    76    79     0     0     0
  42    77    78    79     0     0     0
  43    80    81    84     0     0     0
  44    82    83    84     0     0     0
  45    85    86    89     0     0     0
  46    87    88    89     0     0     0
  47    90    91    94     0     0     0
  48    92    93    94     0     0     0
  49    95    96    99     0     0     0
  50    97    98    99     0     0     0
  51   100   101   104     0     0     0
  52   102   103   104     0     0     0
  53   105   106   109     0     0     0
  54   107   108   109     0     0     0
  55     0     0     0     0     0     0
  56     0     0     0     0     0     0
  57   110   111   114     0     0     0
  58   112   113   114     0     0     0
  59   115   116   119     0     0     0
  60   117   118   119     0     0     0
  61   120   121   124     0     0     0
  62   122   123   124     0     0     0
  63   125   126   129     0     0     0
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
 64   127   128   129      0     0     0
 65   130   131   134      0     0     0
 66   132   133   134      0     0     0
 67   135   136   139      0     0     0
 68   137   138   139      0     0     0
 69   140   141   144      0     0     0
 70   142   143   144      0     0     0
 71   145   146   149      0     0     0
 72   147   148   149      0     0     0
 73   150   151   154      0     0     0
 74   152   153   154      0     0     0
 75   155   156   159      0     0     0
 76   157   158   159      0     0     0
 77     0     0     0      0     0     0
 78     0     0     0      0     0     0
 79   160   161   164      0     0     0
 80   162   163   164      0     0     0
 81   165   166   169      0     0     0
 82   167   168   169      0     0     0
 83   170   171   174      0     0     0
 84   172   173   174      0     0     0
 85   175   176   179      0     0     0
 86   177   178   179      0     0     0
 87   180   181   184      0     0     0
 88   182   183   184      0     0     0
 89   185   186   189      0     0     0
 90   187   188   189      0     0     0
 91   190   191   194      0     0     0
 92   192   193   194      0     0     0
 93   195   196   199      0     0     0
 94   197   198   199      0     0     0
 95   200   201   204      0     0     0
 96   202   203   204      0     0     0
 97   205   206   209      0     0     0
 98   207   208   209      0     0     0
 99   210   211   214      0     0     0
100   212   213   214      0     0     0
101     0     0     0      0     0     0
102     0     0     0      0     0     0
103   215   216   219      0     0     0
104   217   218   219      0     0     0
105   220   221   224      0     0     0
106   222   223   224      0     0     0
107   225   226   229      0     0     0
108   227   228   229      0     0     0
109   230   231   234      0     0     0
110   232   233   234      0     0     0
111   235   236   239      0     0     0
112   237   238   239      0     0     0
113   240   241   244      0     0     0
114   242   243   244      0     0     0
115   245   246   249      0     0     0
116   247   248   249      0     0     0
117   250   251   254      0     0     0
118   252   253   254      0     0     0
119   255   256   259      0     0     0
120   257   258   259      0     0     0
121   260   261   264      0     0     0
122   262   263   264      0     0     0
123   265   266   269      0     0     0
124   267   268   269      0     0     0
125   270   271   274      0     0     0
126   272   273   274      0     0     0
127     0     0     0      0     0     0
128     0     0     0      0     0     0
129   275   276   279      0     0     0
130   277   278   279      0     0     0
131   280   281   284      0     0     0
```

216

```
132   282   283   284      0      0      0
133   285   286   289      0      0      0
134   287   288   289      0      0      0
135   290   291   294      0      0      0
136   292   293   294      0      0      0
137   295   296   299      0      0      0
138   297   298   299      0      0      0
139   300   301   304      0      0      0
140   302   303   304      0      0      0
141   305   306   309      0      0      0
142   307   308   309      0      0      0
143   310   311   314      0      0      0
144   312   313   314      0      0      0
145   315   316   319      0      0      0
146   317   318   319      0      0      0
147   320   321   324      0      0      0
148   322   323   324      0      0      0
149   325   326   329      0      0      0
150   327   328   329      0      0      0
151   330   331   334      0      0      0
152   332   333   334      0      0      0
153   335   336   339      0      0      0
154   337   338   339      0      0      0
155     0     0     0      0      0      0
156     0     0     0      0      0      0
157   340   341   344      0      0      0
158   342   343   344      0      0      0
159   345   346   349      0      0      0
160   347   348   349      0      0      0
161   350   351   354      0      0      0
162   352   353   354      0      0      0
163   355   356   359      0      0      0
164   357   358   359      0      0      0
165   360   361   364      0      0      0
166   362   363   364      0      0      0
167   365   366   369      0      0      0
168   367   368   369      0      0      0
169   370   371   374      0      0      0
170   372   373   374      0      0      0
171   375   376   379      0      0      0
172   377   378   379      0      0      0
173   380   381   384      0      0      0
174   382   383   384      0      0      0
175   385   386   389      0      0      0
176   387   388   389      0      0      0
177   390   391   394      0      0      0
178   392   393   394      0      0      0
179   395   396   399      0      0      0
180   397   398   399      0      0      0
181   400   401   404      0      0      0
182   402   403   404      0      0      0
183   405   406   409      0      0      0
184   407   408   409      0      0      0
185     0     0     0      0      0      0
186     0     0     0      0      0      0
187   410   411   414      0      0      0
188   412   413   414      0      0      0
189   415   416   419      0      0      0
190   417   418   419      0      0      0
191   420   421   424      0      0      0
192   422   423   424      0      0      0
193   425   426   429      0      0      0
194   427   428   429      0      0      0
195   430   431   434      0      0      0
196   432   433   434      0      0      0
197   435   436   439      0      0      0
198   437   438   439      0      0      0
199   440   441   444      0      0      0
```

```
200   442   443   444         0      0      0
201   445   446   449         0      0      0
202   447   448   449         0      0      0
203   450   451   454         0      0      0
204   452   453   454         0      0      0
205   455   456   459         0      0      0
206   457   458   459         0      0      0
207   460   461   464         0      0      0
208   462   463   464         0      0      0
209   465   466   469         0      0      0
210   467   468   469         0      0      0
211   470   471   474         0      0      0
212   472   473   474         0      0      0
213   475   476   479         0      0      0
214   477   478   479         0      0      0
215   480   481   484         0      0      0
216   482   483   484         0      0      0
217     0     0     0         0      0      0
218     0     0     0         0      0      0
219   485     0   487         0      0      0
220   486     0   487         0      0      0
221   488   489   492         0      0      0
222   490   491   492         0      0      0
223   493   494   497         0      0      0
224   495   496   497         0      0      0
225   498   499   502         0      0      0
226   500   501   502         0      0      0
227   503   504   507         0      0      0
228   505   506   507         0      0      0
229   508   509   512         0      0      0
230   510   511   512         0      0      0
231   513   514   517         0      0      0
232   515   516   517         0      0      0
233   518   519   522         0      0      0
234   520   521   522         0      0      0
235   523   524   527         0      0      0
236   525   526   527         0      0      0
237   528   529   532         0      0      0
238   530   531   532         0      0      0
239   533   534   537         0      0      0
240   535   536   537         0      0      0
241   538   539   542         0      0      0
242   540   541   542         0      0      0
243   543   544   547         0      0      0
244   545   546   547         0      0      0
245   548   549   552         0      0      0
246   550   551   552         0      0      0
247   553   554   557         0      0      0
248   555   556   557         0      0      0
249   558   559   562         0      0      0
250   560   561   562         0      0      0
251   563   564   567         0      0      0
252   565   566   567         0      0      0
253     0     0     0         0      0      0
254     0     0     0         0      0      0
255   568     0   570         0      0      0
256   569     0   570         0      0      0
257   571   572   575         0      0      0
258   573   574   575         0      0      0
259   576   577   580         0      0      0
260   578   579   580         0      0      0
261   581   582   585         0      0      0
262   583   584   585         0      0      0
263   586   587   590         0      0      0
264   588   589   590         0      0      0
265   591   592   595         0      0      0
266   593   594   595         0      0      0
267   596   597   600         0      0      0
```

2-08

```
 269  601  602  605    0    0    0
 270  603  604  605    0    0    0
 271  606  607  610    0    0    0
 272  608  609  610    0    0    0
 273  611  612  613    0    0    0
 274  613  614  615    0    0    0
 275  616  617  620    0    0    0
 276  618  619  620    0    0    0
 277  621  622  625    0    0    0
 278  623  624  625    0    0    0
 279  626  627  630    0    0    0
 280  628  629  630    0    0    0
 281  631  632  635    0    0    0
 282  633  634  635    0    0    0
 283  636  637  640    0    0    0
 284  638  639  640    0    0    0
 285  641  642  645    0    0    0
 286  643  644  645    0    0    0
 287  646  647  650    0    0    0
 288  648  649  650    0    0    0
 289    0    0    0    0    0    0
 290    0    0    0    0    0    0
 291  651    0  653    0    0    0
 292  652    0  653    0    0    0
 293  654  655  658    0    0    0
 294  656  657  658    0    0    0
 295  659  660  663    0    0    0
 296  661  662  663    0    0    0
 297  664  665  668    0    0    0
 298  666  667  668    0    0    0
 299  669  670  673    0    0    0
 300  671  672  673    0    0    0
 301  674  675  678    0    0    0
 302  676  677  678    0    0    0
 303  679  680  683    0    0    0
 304  681  682  683    0    0    0
 305  684  685  688    0    0    0
 306  686  687  688    0    0    0
 307  689  690  693    0    0    0
 308  691  692  693    0    0    0
 309  694  695  698    0    0    0
 310  696  697  698    0    0    0
 311  699  700  703    0    0    0
 312  701  702  703    0    0    0
 313  704  705  708    0    0    0
 314  706  707  708    0    0    0
 315  709  710  713    0    0    0
 316  711  712  713    0    0    0
 317  714  715  718    0    0    0
 318  716  717  718    0    0    0
 319  719  720  723    0    0    0
 320  721  722  723    0    0    0
 321  724  725  726    0    0    0
 322  726  727  728    0    0    0
 323  729  730  733    0    0    0
 324  731  732  733    0    0    0
 325    0    0    0    0    0    0
 326    0    0    0    0    0    0
 327  734    0  736    0    0    0
 328  735    0  736    0    0    0
 329  737  738  741    0    0    0
 330  739  740  741    0    0    0
 331  742  743  746    0    0    0
 332  744  745  746    0    0    0
 333  747  748  751    0    0    0
 334  749  750  751    0    0    0
 335  752  753  756    0    0    0
```

017

```
 337  757  758  761     0     0     0
 338  759  760  761     0     0     0
 339  762  763  766     0     0     0
 340  764  765  766     0     0     0
 341  767  768  771     0     0     0
 342  769  770  771     0     0     0
 343  772  773  776     0     0     0
 344  774  775  776     0     0     0
 345  777  778  781     0     0     0
 346  779  780  781     0     0     0
 347  782  783  786     0     0     0
 348  784  785  786     0     0     0
 349  787  788  791     0     0     0
 350  789  790  791     0     0     0
 351  792  793  796     0     0     0
 352  794  795  796     0     0     0
 353  797  798  801     0     0     0
 354  799  800  801     0     0     0
 355  802  803  806     0     0     0
 356  804  805  806     0     0     0
 357  807  808  811     0     0     0
 358  809  810  811     0     0     0
 359  812  813  816     0     0     0
 360  814  815  816     0     0     0
 361    0    0    0     0     0     0
 362    0    0    0     0     0     0
 363  817    0  819     0     0     0
 364  818    0  819     0     0     0
 365  820  821  824     0     0     0
 366  822  823  824     0     0     0
 367  825  826  829     0     0     0
 368  827  828  829     0     0     0
 369  830  831  834     0     0     0
 370  832  833  834     0     0     0
 371  835  836  839     0     0     0
 372  837  838  839     0     0     0
 373  840  841  844     0     0     0
 374  842  843  844     0     0     0
 375  845  846  849     0     0     0
 376  847  848  849     0     0     0
 377  850  851  854     0     0     0
 378  852  853  854     0     0     0
 379  855  856  859     0     0     0
 380  857  858  859     0     0     0
 381  860  861  864     0     0     0
 382  862  863  864     0     0     0
 383  865  866  869     0     0     0
 384  867  868  869     0     0     0
 385  870  871  874     0     0     0
 386  872  873  874     0     0     0
 387  875  876  879     0     0     0
 388  877  878  879     0     0     0
 389  880  881  884     0     0     0
 390  882  883  884     0     0     0
 391  885  886  889     0     0     0
 392  887  888  889     0     0     0
 393  890  891  894     0     0     0
 394  892  893  894     0     0     0
 395  895  896  899     0     0     0
 396  897  898  899     0     0     0
 397    0    0    0     0     0     0
 398    0    0    0     0     0     0
 399  900    0  902     0     0     0
 400  901    0  902     0     0     0
 401  903  904  907     0     0     0
 402  905  906  907     0     0     0
 403  908  909  912     0     0     0
```

```
405  913  914  917    0    0    0
406  915  916  917    0    0    0
407  918  919  922    0    0    0
408  920  921  922    0    0    0
409  923  924  927    0    0    0
410  925  926  927    0    0    0
411  928  929  932    0    0    0
412  930  931  932    0    0    0
413  933  934  937    0    0    0
414  935  936  937    0    0    0
415  938  939  942    0    0    0
416  940  941  942    0    0    0
417  943  944  947    0    0    0
  418  945  946  947    0    0    0
419  948  949  952    0    0    0
420  950  951  952    0    0    0
421  953  954  957    0    0    0
422  955  956  957    0    0    0
423  958  959  962    0    0    0
424  960  961  962    0    0    0
425  963  964  967    0    0    0
426  965  966  967    0    0    0
427  968  969  972    0    0    0
428  970  971  972    0    0    0
429  973  974  977    0    0    0
430  975  976  977    0    0    0
431  978  979  982    0    0    0
432  980  981  982    0    0    0
433    0    0    0    0    0    0
434    0    0    0    0    0    0
435  983    0  985    0    0    0
436  984    0  985    0    0    0
437  986  987  990    0    0    0
438  988  989  990    0    0    0
439  991  992  995    0    0    0
440  993  994  995    0    0    0
441  996  997 1000    0    0    0
442  998  999 1000    0    0    0
443 1001 1002 1005    0    0    0
444 1003 1004 1005    0    0    0
445 1006 1007 1010    0    0    0
446 1008 1009 1010    0    0    0
447 1011 1012 1015    0    0    0
448 1013 1014 1015    0    0    0
449 1016 1017 1020    0    0    0
450 1018 1019 1020    0    0    0
451 1021 1022 1025    0    0    0
452 1023 1024 1025    0    0    0
453 1026 1027 1030    0    0    0
454 1028 1029 1030    0    0    0
455 1031 1032 1035    0    0    0
456 1033 1034 1035    0    0    0
457 1036 1037 1040    0    0    0
458 1038 1039 1040    0    0    0
459 1041 1042 1045    0    0    0
460 1043 1044 1045    0    0    0
461 1046 1047 1050    0    0    0
462 1048 1049 1050    0    0    0
463 1051 1052 1055    0    0    0
464 1053 1054 1055    0    0    0
465 1056 1057 1060    0    0    0
466 1058 1059 1060    0    0    0
467 1061 1062 1065    0    0    0
468 1063 1064 1065    0    0    0
469    0    0    0    0    0    0
470    0    0    0    0    0    0
471 1066    0 1068    0    0    0
```

```
473 1069 1070 1073    0    0    0
474 1071 1072 1073    0    0    0
475 1074 1075 1078    0    0    0
476 1076 1077 1078    0    0    0
477 1079 1080 1083    0    0    0
478 1081 1082 1083    0    0    0
479 1084 1085 1088    0    0    0
480 1086 1087 1088    0    0    0
481 1089 1090 1093    0    0    0
482 1091 1092 1093    0    0    0
483 1094 1095 1098    0    0    0
484 1096 1097 1098    0    0    0
485 1099 1100 1103    0    0    0
486 1101 1102 1103    0    0    0
487 1104 1105 1108    0    0    0
488 1106 1107 1108    0    0    0
489 1109 1110 1113    0    0    0
490 1111 1112 1113    0    0    0
491 1114 1115 1118    0    0    0
492 1116 1117 1118    0    0    0
493 1119 1120 1123    0    0    0
494 1121 1122 1123    0    0    0
495 1124 1125 1128    0    0    0
496 1126 1127 1128    0    0    0
497 1129 1130 1133    0    0    0
498 1131 1132 1133    0    0    0
499 1134 1135 1138    0    0    0
500 1136 1137 1138    0    0    0
501 1139 1140 1143    0    0    0
502 1141 1142 1143    0    0    0
503 1144 1145 1148    0    0    0
504 1146 1147 1148    0    0    0
505    0    0    0    0    0    0
506    0    0    0    0    0    0
507    0    0    0    0    0    0
508    0    0    0    0    0    0
509    0    0    0    0    0    0
510    0    0    0    0    0    0
511    0    0    0    0    0    0
512    0    0    0    0    0    0
513    0    0    0    0    0    0
514    0    0    0    0    0    0
515    0    0    0    0    0    0
516    0    0    0    0    0    0
517    0    0    0    0    0    0
518    0    0    0    0    0    0
519    0    0    0    0    0    0
520    0    0    0    0    0    0
521    0    0    0    0    0    0
522    0    0    0    0    0    0
523    0    0    0    0    0    0
524    0    0    0    0    0    0
525    0    0    0    0    0    0
526    0    0    0    0    0    0
527    0    0    0    0    0    0
528    0    0    0    0    0    0
529    0    0    0    0    0    0
530    0    0    0    0    0    0
531    0    0    0    0    0    0
532    0    0    0    0    0    0
533    0    0    0    0    0    0
534    0    0    0    0    0    0
535    0    0    0    0    0    0
536    0    0    0    0    0    0
537    0    0    0    0    0    0
538    0    0    0    0    0    0
539    0    0    0    0    0    0
```

ORIGINAL PAGE
OF POOR QUALITY

~~216~~
212

```
540      0      0      0      0      0      0
541      0      0      0      0      0      0
542      0      0      0      0      0      0
REQUIRED BLANK COMMON FOR THIS STEP=    5426
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
S H E L L   E L E M E N T S

     R OF SHELL ELEMENTS=  480
     R OF DIFF.  LAYERS=     1
     US=        100.000


ELEMENT       MULTIPLIERS
                    A                  B                   C                   D
                      0.0        0.0        0.0
                      0.0        0.0        0.0
                      0.0        0.0        0.0
                      0.0        0.0        0.0
```

```
   N    I1    J1    K1    I2    J2    K2  LAYER   BAND
   1     1    19    21     2    20    22      1     34
   2    21     3     1    22     4     2      1     34
   3     3    21    23     4    22    24      1     36
   4    23     5     3    24     6     4      1     36
   5     5    23    25     6    24    26      1     38
   6    25     7     5    26     8     6      1     38
   7     7    25    27     8    26    28      1     40
   8    27     9     7    28    10     8      1     40
   9     9    27    29    10    28    30      1     42
  10    29    11     9    30    12    10      1     42
  11    11    29    31    12    30    32      1     44
  12    31    13    11    32    14    12      1     44
  13    13    31    33    14    32    34      1     46
  14    33    15    13    34    16    14      1     46
  15    15    33    35    16    34    36      1     43
  16    35    17    15    36    18    16      1      3
  17    19    39    37    20    40    38      1     50
  18    19    39    41    20    40    42      1     55
  19    41    21    19    42    22    20      1     55
  20    21    41    43    22    42    44      1     55
  21    43    23    21    44    24    22      1     55
  22    23    43    45    24    44    46      1     55
  23    45    25    23    46    26    24      1     55
  24    25    45    47    26    46    48      1     55
  25    47    27    25    48    28    26      1     55
  26    27    47    49    28    48    50      1     55
  27    49    29    27    50    30    28      1     55
  28    29    49    51    30    50    52      1     55
  29    51    31    29    52    32    30      1     55
  30    31    51    53    32    52    54      1     55
  31    53    33    31    54    34    32      1     55
  32    33    53    55    34    54    56      1     50
  33    55    35    33    56    36    34      1      5
  34    37    59    57    38    60    58      1     55
  35    37    59    61    38    60    62      1     60
  36    61    39    37    62    40    38      1     60
  37    39    61    63    40    62    64      1     60
  38    63    41    39    64    42    40      1     60
  39    41    63    65    42    64    66      1     60
  40    65    43    41    66    44    42      1     60
  41    43    65    67    44    66    68      1     60
  42    67    45    43    68    46    44      1     60
  43    45    67    69    46    68    70      1     60
  44    69    47    45    70    48    46      1     60
  45    47    69    71    48    70    72      1     60
  46    71    49    47    72    50    48      1     60
  47    49    71    73    50    72    74      1     60
  48    73    51    49    74    52    50      1     60
  49    51    73    75    52    74    76      1     60
  50    75    53    51    76    54    52      1     60
  51    53    75    77    54    76    78      1     55
  52    77    55    53    78    56    54      1      5
  53    57    81    79    58    82    80      1     60
  54    57    81    83    58    82    84      1     65
  55    83    59    57    84    60    58      1     65
  56    59    83    85    60    84    86      1     65
  57    85    61    59    86    62    60      1     65
  58    61    85    87    62    86    88      1     65
  59    87    63    61    88    64    62      1     65
  60    63    87    89    64    88    90      1     65
  61    89    65    63    90    66    64      1     65
  62    65    89    91    66    90    92      1     65
  63    91    67    65    92    68    66      1     65
  64    67    91    93    68    92    94      1     65
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
 66    69    93    95    70    94    96     1     65
 67    95    71    69    96    72    70     1     65
 68    71    95    97    72    96    98     1     65
 69    97    73    71    98    74    72     1     65
 70    73    97    99    74    98   100     1     65
 71    99    75    73   100    76    74     1     65
 72    75    99   101    76   100   102     1     60
 73   101    77    75   102    78    76     1      5
 74    79   105   103    80   106   104     1     65
 75    79   105   107    80   106   108     1     70
 76   107    81    79   108    82    80     1     70
 77    81   107   109    82   108   110     1     70
 78   109    83    81   110    84    82     1     70
 79    83   109   111    84   110   112     1     70
 80   111    85    83   112    86    84     1     70
 81    85   111   113    86   112   114     1     70
 82   113    87    85   114    88    86     1     70
 83    87   113   115    88   114   116     1     70
 84   115    89    87   116    90    88     1     70
 85    89   115   117    90   116   118     1     70
 86   117    91    89   118    92    90     1     70
 87    91   117   119    92   118   120     1     70
 88   119    93    91   120    94    92     1     70
 89    93   119   121    94   120   122     1     70
 90   121    95    93   122    96    94     1     70
 91    95   121   123    96   122   124     1     70
 92   123    97    95   124    98    96     1     70
 93    97   123   125    98   124   126     1     70
 94   125    99    97   126   100    98     1     70
 95    99   125   127   100   126   128     1     65
 96   127   101    99   128   102   100     1      5
 97   103   131   129   104   132   130     1     70
 98   103   131   133   104   132   134     1     75
 99   133   105   103   134   106   104     1     75
100   105   133   135   106   134   136     1     75
101   135   107   105   136   108   106     1     75
102   107   135   137   108   136   138     1     75
103   137   109   107   138   110   108     1     75
104   109   137   139   110   138   140     1     75
105   139   111   109   140   112   110     1     75
106   111   139   141   112   140   142     1     75
107   141   113   111   142   114   112     1     75
108   113   141   143   114   142   144     1     75
109   143   115   113   144   116   114     1     75
110   115   143   145   116   144   146     1     75
111   145   117   115   146   118   116     1     75
112   117   145   147   118   146   148     1     75
113   147   119   117   148   120   118     1     75
114   119   147   149   120   148   150     1     75
115   149   121   119   150   122   120     1     75
116   121   149   151   122   150   152     1     75
117   151   123   121   152   124   122     1     75
118   123   151   153   124   152   154     1     75
119   153   125   123   154   126   124     1     75
120   125   153   155   126   154   156     1     70
121   155   127   125   156   128   126     1      5
122   129   159   157   130   160   158     1     75
123   129   159   161   130   160   162     1     80
124   161   131   129   162   132   130     1     80
125   131   161   163   132   162   164     1     80
126   163   133   131   164   134   132     1     80
127   133   163   165   134   164   166     1     80
128   165   135   133   166   136   134     1     80
129   135   165   167   136   166   168     1     80
130   167   137   135   168   138   136     1     80
131   137   167   169   138   168   170     1     80
132   169   139   137   170   140   138     1     80
```

C-2

```
 134  171  141  139  172  142  140    1    80
 135  141  171  173  142  172  174    1    80
 136  173  143  141  174  144  142    1    80
 137  143  173  175  144  174  176    1    80
 138  175  145  143  176  146  144    1    80
 139  145  175  177  146  176  178    1    80
 140  177  147  145  178  148  146    1    80
 141  147  177  179  148  178  180    1    80
 142  179  149  147  180  150  148    1    80
 143  149  179  181  150  180  182    1    80
 144  181  151  149  182  152  150    1    80
 145  151  181  183  152  182  184    1    80
 146  183  153  151  184  154  152    1    80
 147  153  183  185  154  184  186    1    75
 148  185  155  153  186  156  154    1     5
 149  157  189  187  158  190  188    1    80
 150  157  189  191  158  190  192    1    85
 151  191  159  157  192  160  158    1    85
 152  159  191  193  160  192  194    1    85
 153  193  161  159  194  162  160    1    85
 154  161  193  195  162  194  196    1    85
 155  195  163  161  196  164  162    1    85
 156  163  195  197  164  196  198    1    85
 157  197  165  163  198  166  164    1    85
 158  165  197  199  166  198  200    1    85
 159  199  167  165  200  168  166    1    85
 160  167  199  201  168  200  202    1    85
 161  201  169  167  202  170  168    1    85
 162  169  201  203  170  202  204    1    85
 163  203  171  169  204  172  170    1    85
 164  171  203  205  172  204  206    1    85
 165  205  173  171  206  174  172    1    85
 166  173  205  207  174  206  208    1    85
 167  207  175  173  208  176  174    1    85
 168  175  207  209  176  208  210    1    85
 169  209  177  175  210  178  176    1    85
 170  177  209  211  178  210  212    1    85
 171  211  179  177  212  180  178    1    85
 172  179  211  213  180  212  214    1    85
 173  213  181  179  214  182  180    1    85
 174  181  213  215  182  214  216    1    85
 175  215  183  181  216  184  182    1    85
 176  183  215  217  184  216  218    1    85
 177  217  185  183  218  186  184    1     5
 178  187  223  221  188  224  222    1    88
 179  187  223  225  188  224  226    1    93
 180  225  189  187  226  190  188    1    93
 181  189  225  227  190  226  228    1    93
 182  227  191  189  228  192  190    1    93
 183  191  227  229  192  228  230    1    93
 184  229  193  191  230  194  192    1    93
 185  193  229  231  194  230  232    1    93
 186  231  195  193  232  196  194    1    93
 187  195  231  233  196  232  234    1    93
 188  233  197  195  234  198  196    1    93
 189  197  233  235  198  234  236    1    93
 190  235  199  197  236  200  198    1    93
 191  199  235  237  200  236  238    1    93
 192  237  201  199  238  202  200    1    93
 193  201  237  239  202  238  240    1    93
 194  239  203  201  240  204  202    1    93
 195  203  239  241  204  240  242    1    93
 196  241  205  203  242  206  204    1    93
 197  205  241  243  206  242  244    1    93
 198  243  207  205  244  208  206    1    93
 199  207  243  245  208  244  246    1    93
 200  245  209  207  246  210  208    1    93
 201  209  245  247  210  246  248     1     93
 202  247  211  209  248  212  210     1     93
 203  211  247  249  212  248  250     1     93
 204  249  213  211  250  214  212     1     93
 205  213  249  251  214  250  252     1     93
 206  251  215  213  252  216  214     1     93
 207  215  251  253  216  252  254     1     36
 208  253  217  215  254  218  216     1      5
 209  219  255  257  220  256  258     1     91
 210  257  221  219  258  222  220     1     91
 211  221  257  259  222  258  260     1     93
 212  259  223  221  260  224  222     1     93
 213  223  259  261  224  260  262     1     93
 214  261  225  223  262  226  224     1     93
 215  225  261  263  226  262  264     1     93
 216  263  227  225  264  228  226     1     93
 217  227  263  265  228  264  266     1     93
 218  265  229  227  266  230  228     1     93
 219  229  265  267  230  266  268     1     93
 220  267  231  229  268  232  230     1     93
 221  231  267  269  232  268  270     1     93
 222  269  233  231  270  234  232     1     93
 223  233  269  271  234  270  272     1     93
 224  271  235  233  272  236  234     1     93
 225  235  271  273  236  272  274     1     93
 226  273  237  235  274  238  236     1     93
 227  237  273  275  238  274  276     1     93
 228  275  239  237  276  240  238     1     93
 229  239  275  277  240  276  278     1     93
 230  277  241  239  278  242  240     1     93
 231  241  277  279  242  278  280     1     93
 232  279  243  241  280  244  242     1     93
 233  243  279  281  244  280  282     1     93
 234  281  245  243  282  246  244     1     93
 235  245  281  283  246  282  284     1     93
 236  283  247  245  284  248  246     1     93
 237  247  283  285  248  284  286     1     93
 238  285  249  247  286  250  248     1     93
 239  249  285  287  250  286  288     1     93
 240  287  251  249  288  252  250     1     93
 241  251  287  289  252  288  290     1     36
 242  289  253  251  290  254  252     1      5
 243  255  291  293  256  292  294     1     91
 244  293  257  255  294  258  256     1     91
 245  257  293  295  258  294  296     1     93
 246  295  259  257  296  260  258     1     93
 247  259  295  297  260  296  298     1     93
 248  297  261  259  298  262  260     1     93
 249  261  297  299  262  298  300     1     93
 250  299  263  261  300  264  262     1     93
 251  263  299  301  264  300  302     1     93
 252  301  265  263  302  266  264     1     93
 253  265  301  303  266  302  304     1     93
 254  303  267  265  304  268  266     1     93
 255  267  303  305  268  304  306     1     93
 256  305  269  267  306  270  268     1     93
 257  269  305  307  270  306  308     1     93
 258  307  271  269  308  272  270     1     93
 259  271  307  309  272  308  310     1     93
 260  309  273  271  310  274  272     1     93
 261  273  309  311  274  310  312     1     93
 262  311  275  273  312  276  274     1     93
 263  275  311  313  276  312  314     1     93
 264  313  277  275  314  278  276     1     93
 265  277  313  315  278  314  316     1     93
 266  315  279  277  316  280  278     1     93
 267  279  315  317  280  316  318     1     93
 268  317  281  279  318  282  280     1     93
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
269   281   317   319   282   318   320        1         93
270   319   283   281   320   284   282        1         93
271   283   319   321   284   320   322        1         93
272   321   285   283   322   286   284        1         93
273   285   321   323   286   322   324        1         93
274   323   287   285   324   288   286        1         93
275   287   323   325   288   324   326        1         88
276   325   289   287   326   290   288        1          5
277   291   327   329   292   328   330        1         91
278   329   293   291   330   294   292        1         91
279   293   329   331   294   330   332        1         93
280   331   295   293   332   296   294        1         93
281   295   331   333   296   332   334        1         93
282   333   297   295   334   298   296        1         93
283   297   333   335   298   334   336        1         93
284   335   299   297   336   300   298        1         93
285   299   335   337   300   336   338        1         93
286   337   301   299   338   302   300        1         93
287   301   337   339   302   338   340        1         93
288   339   303   301   340   304   302        1         93
289   303   339   341   304   340   342        1         93
290   341   305   303   342   306   304        1         93
291   305   341   343   306   342   344        1         93
292   343   307   305   344   308   306        1         93
293   307   343   345   308   344   346        1         93
294   345   309   307   346   310   308        1         93
295   309   345   347   310   346   348        1         93
296   347   311   309   348   312   310        1         93
297   311   347   349   312   348   350        1         93
298   349   313   311   350   314   312        1         93
299   313   349   351   314   350   352        1         93
300   351   315   313   352   316   314        1         93
301   315   351   353   316   352   354        1         93
302   353   317   315   354   318   316        1         93
303   317   353   355   318   354   356        1         93
304   355   319   317   356   320   318        1         93
305   319   355   357   320   356   358        1         93
306   357   321   319   358   322   320        1         93
307   321   357   359   322   358   360        1         93
308   359   323   321   360   324   322        1         93
309   323   359   361   324   360   362        1         88
310   361   325   323   362   326   324        1          5
311   327   363   365   328   364   366        1         91
312   365   329   327   366   330   328        1         91
313   329   365   367   330   366   368        1         93
314   367   331   329   368   332   330        1         93
315   331   367   369   332   368   370        1         93
316   369   333   331   370   334   332        1         93
317   333   369   371   334   370   372        1         93
318   371   335   333   372   336   334        1         93
319   335   371   373   336   372   374        1         93
320   373   337   335   374   338   336        1         93
321   337   373   375   338   374   376        1         93
322   375   339   337   376   340   338        1         93
323   339   375   377   340   376   378        1         93
324   377   341   339   378   342   340        1         93
325   341   377   379   342   378   380        1         93
326   379   343   341   380   344   342        1         93
327   343   379   381   344   380   382        1         93
328   381   345   343   382   346   344        1         93
329   345   381   383   346   382   384        1         93
330   383   347   345   384   348   346        1         93
331   347   383   385   348   384   386        1         93
332   385   349   347   386   350   348        1         93
333   349   385   387   350   386   388        1         93
334   387   351   349   388   352   350        1         93
335   351   387   389   352   388   390        1         93
336   389   353   351   390   354   352        1         93
```

```
 337  353  389  391  354  390  392     1     93
 338  391  355  353  392  356  354     1     93
 339  355  391  393  356  392  394     1     93
 340  393  357  355  394  358  356     1     93
 341  357  393  395  358  394  396     1     93
 342  395  359  357  396  360  358     1     93
 343  359  395  397  360  396  398     1     88
 344  397  361  359  398  362  360     1      5
 345  363  399  401  364  400  402     1     91
 346  401  365  363  402  366  364     1     91
 347  365  401  403  366  402  404     1     93
 348  403  367  365  404  368  366     1     93
 349  367  403  405  368  404  406     1     93
 350  405  369  367  406  370  368     1     93
 351  369  405  407  370  406  408     1     93
 352  407  371  369  408  372  370     1     93
 353  371  407  409  372  408  410     1     93
 354  409  373  371  410  374  372     1     93
 355  373  409  411  374  410  412     1     93
 356  411  375  373  412  376  374     1     93
 357  375  411  413  376  412  414     1     93
 358  413  377  375  414  378  376     1     93
 359  377  413  415  378  414  416     1     93
 360  415  379  377  416  380  378     1     93
 361  379  415  417  380  416  418     1     93
 362  417  381  379  418  382  380     1     93
 363  381  417  419  382  418  420     1     93
 364  419  383  381  420  384  382     1     93
 365  383  419  421  384  420  422     1     93
 366  421  385  383  422  386  384     1     93
 367  385  421  423  386  422  424     1     93
 368  423  387  385  424  388  386     1     93
 369  387  423  425  388  424  426     1     93
 370  425  389  387  426  390  388     1     93
 371  389  425  427  390  426  428     1     93
 372  427  391  389  428  392  390     1     93
 373  391  427  429  392  428  430     1     93
 374  429  393  391  430  394  392     1     93
 375  393  429  431  394  430  432     1     93
 376  431  395  393  432  396  394     1     93
 377  395  431  433  396  432  434     1     88
 378  433  397  395  434  398  396     1      5
 379  399  435  437  400  436  438     1     91
 380  437  401  399  438  402  400     1     91
 381  401  437  439  402  438  440     1     93
 382  439  403  401  440  404  402     1     93
 383  403  439  441  404  440  442     1     93
 384  441  405  403  442  406  404     1     93
 385  405  441  443  406  442  444     1     93
 386  443  407  405  444  408  406     1     93
 387  407  443  445  408  444  446     1     93
 388  445  409  407  446  410  408     1     93
 389  409  445  447  410  446  448     1     93
 390  447  411  409  448  412  410     1     93
 391  411  447  449  412  448  450     1     93
 392  449  413  411  450  414  412     1     93
 393  413  449  451  414  450  452     1     93
 394  451  415  413  452  416  414     1     93
 395  415  451  453  416  452  454     1     93
 396  453  417  415  454  418  416     1     93
 397  417  453  455  418  454  456     1     93
 398  455  419  417  456  420  418     1     93
 399  419  455  457  420  456  458     1     93
 400  457  421  419  458  422  420     1     93
 401  421  457  459  422  458  460     1     93
 402  459  423  421  460  424  422     1     93
 403  423  459  461  424  460  462     1     93
 404  461  425  423  462  426  424     1     93
 405   425   461   463   426   462   464      1     93
 406   463   427   425   464   428   426      1     93
 407   427   463   465   426   464   466      1     93
 408   465   429   427   466   430   428      1     93
 409   429   465   467   430   466   468      1     93
 410   467   431   429   468   432   430      1     93
 411   431   467   469   432   468   470      1     88
 412   469   433   431   470   434   432      1      5
 413   435   471   473   436   472   474      1     91
 414   473   437   435   474   438   436      1     91
 415   437   473   475   438   474   476      1     93
 416   475   439   437   476   440   438      1     93
 417   439   475   477   440   476   478      1     93
 418   477   441   439   478   442   440      1     93
 419   441   477   479   442   478   480      1     93
 420   479   443   441   480   444   442      1     93
 421   443   479   481   444   480   482      1     93
 422   481   445   443   482   446   444      1     93
 423   445   481   483   446   482   484      1     93
 424   483   447   445   484   448   446      1     93
 425   447   483   485   448   484   486      1     93
 426   485   449   447   486   450   448      1     93
 427   449   485   487   450   486   488      1     93
 428   487   451   449   488   452   450      1     93
 429   451   487   489   452   488   490      1     93
 430   489   453   451   490   454   452      1     93
 431   453   489   491   454   490   492      1     93
 432   491   455   453   492   456   454      1     93
 433   455   491   493   456   492   494      1     93
 434   493   457   455   494   458   456      1     93
 435   457   493   495   458   494   496      1     93
 436   495   459   457   496   460   458      1     93
 437   459   495   497   460   496   498      1     93
 438   497   461   459   498   462   460      1     93
 439   461   497   499   462   498   500      1     93
 440   499   463   461   500   464   462      1     93
 441   463   499   501   464   500   502      1     93
 442   501   465   463   502   466   464      1     93
 443   465   501   503   466   502   504      1     93
 444   503   467   465   504   468   466      1     93
 445   467   503   505   468   504   506      1     88
 446   505   469   467   506   470   468      1      5
 447   471   507   509   472   508   510      1      5
 448   509   473   471   510   474   472      1      8
 449   473   509   511   474   510   512      1      5
 450   511   475   473   512   476   474      1     10
 451   475   511   513   476   512   514      1      5
 452   513   477   475   514   478   476      1     10
 453   477   513   515   478   514   516      1      5
 454   515   479   477   516   480   478      1     10
 455   479   515   517   480   516   518      1      5
 456   517   481   479   518   482   480      1     10
 457   481   517   519   482   518   520      1      5
 458   519   483   481   520   484   482      1     10
 459   483   519   521   484   520   522      1      5
 460   521   485   483   522   486   484      1     10
 461   485   521   523   486   522   524      1      5
 462   523   487   485   524   488   486      1     10
 463   487   523   525   488   524   526      1      5
 464   525   489   487   526   490   488      1     10
 465   489   525   527   490   526   528      1      5
 466   527   491   489   528   492   490      1     10
 467   491   527   529   492   528   530      1      5
 468   529   493   491   530   494   492      1     10
 469   493   529   531   494   530   532      1      5
 470   531   495   493   532   496   494      1     10
 471   495   531   533   496   532   534      1      5
 472   533   497   495   534   498   496      1     10
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
 473  497  533  535  498  534  536      1     5
 474  535  499  497  536  500  498      1    10
 475  499  535  537  500  536  538      1     5
 476  537  501  499  538  502  500      1    10
 477  501  537  539  502  538  540      1     5
 478  539  503  501  540  504  502      1    10
 479  503  539  541  504  540  542      1     5
 480  541  505  503  542  506  504      1     5
REQUIRED BLANK COMMON FOR THIS STEP=    5645
```

```
E Q U A T I O N   P A R A M E T E R S

 TOTAL NUMBER OF EQUATIONS        = 1140
 BANDWIDTH                        =   95
 NUMBER OF EQUATIONS IN A BLOCK   =   52
 NUMBER OF BLOCKS                 =   23
```

ORIGINAL PAGE IS
OF POOR QUALITY

NODAL LOADS (STATIC) OR MASSES (DYNAMIC)

NODE NUMBER	LOAD CASE	X-AXIS FORCE	Y-AXIS FORCE	Z-AXIS FORCE	X-AXIS MOMENT	Y-AXIS MOMENT	Z-AXIS MOMENT
2	1	0.00000E+00	0.00000E+00	2.94112E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	1	0.00000E+00	0.00000E+00	4.41168E-01	0.00000E+00	0.00000E+00	0.00000E+00
6	1	0.00000E+00	0.00000E+00	6.72256E-01	0.00000E+00	0.00000E+00	0.00000E+00
8	1	0.00000E+00	0.00000E+00	7.67800E-01	0.00000E+00	0.00000E+00	0.00000E+00
10	1	0.00000E+00	0.00000E+00	1.05040E+00	0.00000E+00	0.00000E+00	0.00000E+00
12	1	0.00000E+00	0.00000E+00	1.18170E+00	0.00000E+00	0.00000E+00	0.00000E+00
14	1	0.00000E+00	0.00000E+00	1.44430E+00	0.00000E+00	0.00000E+00	0.00000E+00
16	1	0.00000E+00	0.00000E+00	1.57560E+00	0.00000E+00	0.00000E+00	0.00000E+00
18	1	0.00000E+00	0.00000E+00	5.25200E-01	0.00000E+00	0.00000E+00	0.00000E+00
20	1	0.00000E+00	0.00000E+00	5.30805E-01	0.00000E+00	0.00000E+00	0.00000E+00
22	1	0.00000E+00	0.00000E+00	6.73852E-01	0.00000E+00	0.00000E+00	0.00000E+00
24	1	0.00000E+00	0.00000E+00	1.21604E+00	0.00000E+00	0.00000E+00	0.00000E+00
26	1	0.00000E+00	0.00000E+00	1.56045E+00	0.00000E+00	0.00000E+00	0.00000E+00
28	1	0.00000E+00	0.00000E+00	1.94930E+00	0.00000E+00	0.00000E+00	0.00000E+00
30	1	0.00000E+00	0.00000E+00	2.34068E+00	0.00000E+00	0.00000E+00	0.00000E+00
32	1	0.00000E+00	0.00000E+00	2.72953E+00	0.00000E+00	0.00000E+00	0.00000E+00
34	1	0.00000E+00	0.00000E+00	3.12090E+00	0.00000E+00	0.00000E+00	0.00000E+00
36	1	0.00000E+00	0.00000E+00	1.36530E+00	0.00000E+00	0.00000E+00	0.00000E+00
38	1	0.00000E+00	0.00000E+00	4.22365E-01	0.00000E+00	0.00000E+00	0.00000E+00
40	1	0.00000E+00	0.00000E+00	6.03206E-01	0.00000E+00	0.00000E+00	0.00000E+00
42	1	0.00000E+00	0.00000E+00	8.42744E-01	0.00000E+00	0.00000E+00	0.00000E+00
44	1	0.00000E+00	0.00000E+00	1.17086E+00	0.00000E+00	0.00000E+00	0.00000E+00
46	1	0.00000E+00	0.00000E+00	1.50490E+00	0.00000E+00	0.00000E+00	0.00000E+00
48	1	0.00000E+00	0.00000E+00	1.87776E+00	0.00000E+00	0.00000E+00	0.00000E+00
50	1	0.00000E+00	0.00000E+00	2.25735E+00	0.00000E+00	0.00000E+00	0.00000E+00
52	1	0.00000E+00	0.00000E+00	2.63021E+00	0.00000E+00	0.00000E+00	0.00000E+00
54	1	0.00000E+00	0.00000E+00	3.00980E+00	0.00000E+00	0.00000E+00	0.00000E+00
56	1	0.00000E+00	0.00000E+00	1.51837E+00	0.00000E+00	0.00000E+00	0.00000E+00
58	1	0.00000E+00	0.00000E+00	6.02095E-01	0.00000E+00	0.00000E+00	0.00000E+00
60	1	0.00000E+00	0.00000E+00	5.39020E-01	0.00000E+00	0.00000E+00	0.00000E+00
62	1	0.00000E+00	0.00000E+00	6.53403E-01	0.00000E+00	0.00000E+00	0.00000E+00
64	1	0.00000E+00	0.00000E+00	7.89012E-01	0.00000E+00	0.00000E+00	0.00000E+00
66	1	0.00000E+00	0.00000E+00	1.09491E+00	0.00000E+00	0.00000E+00	0.00000E+00
68	1	0.00000E+00	0.00000E+00	1.40895E+00	0.00000E+00	0.00000E+00	0.00000E+00
70	1	0.00000E+00	0.00000E+00	1.75656E+00	0.00000E+00	0.00000E+00	0.00000E+00
72	1	0.00000E+00	0.00000E+00	2.11343E+00	0.00000E+00	0.00000E+00	0.00000E+00
74	1	0.00000E+00	0.00000E+00	2.46103E+00	0.00000E+00	0.00000E+00	0.00000E+00
76	1	0.00000E+00	0.00000E+00	2.81790E+00	0.00000E+00	0.00000E+00	0.00000E+00
78	1	0.00000E+00	0.00000E+00	1.42747E+00	0.00000E+00	0.00000E+00	0.00000E+00
80	1	0.00000E+00	0.00000E+00	7.17807E-01	0.00000E+00	0.00000E+00	0.00000E+00
82	1	0.00000E+00	0.00000E+00	7.24944E-01	0.00000E+00	0.00000E+00	0.00000E+00
84	1	0.00000E+00	0.00000E+00	6.22564E-01	0.00000E+00	0.00000E+00	0.00000E+00
86	1	0.00000E+00	0.00000E+00	5.91708E-01	0.00000E+00	0.00000E+00	0.00000E+00
88	1	0.00000E+00	0.00000E+00	7.15484E-01	0.00000E+00	0.00000E+00	0.00000E+00
90	1	0.00000E+00	0.00000E+00	9.91012E-01	0.00000E+00	0.00000E+00	0.00000E+00
92	1	0.00000E+00	0.00000E+00	1.27765E+00	0.00000E+00	0.00000E+00	0.00000E+00
94	1	0.00000E+00	0.00000E+00	1.59075E+00	0.00000E+00	0.00000E+00	0.00000E+00
96	1	0.00000E+00	0.00000E+00	1.91648E+00	0.00000E+00	0.00000E+00	0.00000E+00
98	1	0.00000E+00	0.00000E+00	2.22958E+00	0.00000E+00	0.00000E+00	0.00000E+00
100	1	0.00000E+00	0.00000E+00	2.55530E+00	0.00000E+00	0.00000E+00	0.00000E+00
102	1	0.00000E+00	0.00000E+00	1.30290E+00	0.00000E+00	0.00000E+00	0.00000E+00
104	1	0.00000E+00	0.00000E+00	7.58914E-01	0.00000E+00	0.00000E+00	0.00000E+00
106	1	0.00000E+00	0.00000E+00	6.25305E-01	0.00000E+00	0.00000E+00	0.00000E+00
108	1	0.00000E+00	0.00000E+00	7.95543E-01	0.00000E+00	0.00000E+00	0.00000E+00
110	1	0.00000E+00	0.00000E+00	5.44575E-01	0.00000E+00	0.00000E+00	0.00000E+00
112	1	0.00000E+00	0.00000E+00	5.16245E-01	0.00000E+00	0.00000E+00	0.00000E+00
114	1	0.00000E+00	0.00000E+00	6.24988E-01	0.00000E+00	0.00000E+00	0.00000E+00
116	1	0.00000E+00	0.00000E+00	8.64223E-01	0.00000E+00	0.00000E+00	0.00000E+00
118	1	0.00000E+00	0.00000E+00	1.11605E+00	0.00000E+00	0.00000E+00	0.00000E+00
[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

```
120   1   0.00000E+00   0.00000E+00   [illegible]   0.00000E+00   0.00000E+00   0.00000E+00
122   1   0.00000E+00   0.00000E+00   1.67408E+00   0.00000E+00   0.00000E+00   0.00000E+00
124   1   0.00000E+00   0.00000E+00   1.94593E+00   0.00000E+00   0.00000E+00   0.00000E+00
126   1   0.00000E+00   0.00000E+00   2.23210E+00   0.00000E+00   0.00000E+00   0.00000E+00
128   1   0.00000E+00   0.00000E+00   1.14467E+00   0.00000E+00   0.00000E+00   0.00000E+00
130   1   0.00000E+00   0.00000E+00   7.17837E-01   0.00000E+00   0.00000E+00   0.00000E+00
132   1   0.00000E+00   0.00000E+00   8.25335E-01   0.00000E+00   0.00000E+00   0.00000E+00
134   1   0.00000E+00   0.00000E+00   8.58231E-01   0.00000E+00   0.00000E+00   0.00000E+00
136   1   0.00000E+00   0.00000E+00   8.83435E-01   0.00000E+00   0.00000E+00   0.00000E+00
138   1   0.00000E+00   0.00000E+00   4.54534E-01   0.00000E+00   0.00000E+00   0.00000E+00
140   1   0.00000E+00   0.00000E+00   4.28860E-01   0.00000E+00   0.00000E+00   0.00000E+00
142   1   0.00000E+00   0.00000E+00   5.20352E-01   0.00000E+00   0.00000E+00   0.00000E+00
144   1   0.00000E+00   0.00000E+00   7.17369E-01   0.00000E+00   0.00000E+00   0.00000E+00
146   1   0.00000E+00   0.00000E+00   9.29260E-01   0.00000E+00   0.00000E+00   0.00000E+00
148   1   0.00000E+00   0.00000E+00   1.15308E+00   0.00000E+00   0.00000E+00   0.00000E+00
150   1   0.00000E+00   0.00000E+00   1.39350E+00   0.00000E+00   0.00000E+00   0.00000E+00
152   1   0.00000E+00   0.00000E+00   1.61765E+00   0.00000E+00   0.00000E+00   0.00000E+00
154   1   0.00000E+00   0.00000E+00   1.65340E+00   0.00000E+00   0.00000E+00   0.00000E+00
156   1   0.00000E+00   0.00000E+00   9.82637E-01   0.00000E+00   0.00000E+00   0.00000E+00
158   1   0.00000E+00   0.00000E+00   8.02395E-01   0.00000E+00   0.00000E+00   0.00000E+00
160   1   0.00000E+00   0.00000E+00   7.24944E-01   0.00000E+00   0.00000E+00   0.00000E+00
162   1   0.00000E+00   0.00000E+00   7.95543E-01   0.00000E+00   0.00000E+00   0.00000E+00
164   1   0.00000E+00   0.00000E+00   8.83435E-01   0.00000E+00   0.00000E+00   0.00000E+00
166   1   0.00000E+00   0.00000E+00   5.13215E-01   0.00000E+00   0.00000E+00   0.00000E+00
168   1   0.00000E+00   0.00000E+00   3.52052E-01   0.00000E+00   0.00000E+00   0.00000E+00
170   1   0.00000E+00   0.00000E+00   3.29933E-01   0.00000E+00   0.00000E+00   0.00000E+00
172   1   0.00000E+00   0.00000E+00   4.01576E-01   0.00000E+00   0.00000E+00   0.00000E+00
174   1   0.00000E+00   0.00000E+00   5.51191E-01   0.00000E+00   0.00000E+00   0.00000E+00
176   1   0.00000E+00   0.00000E+00   7.17133E-01   0.00000E+00   0.00000E+00   0.00000E+00
178   1   0.00000E+00   0.00000E+00   8.87117E-01   0.00000E+00   0.00000E+00   0.00000E+00
180   1   0.00000E+00   0.00000E+00   1.07585E+00   0.00000E+00   0.00000E+00   0.00000E+00
182   1   0.00000E+00   0.00000E+00   1.24587E+00   0.00000E+00   0.00000E+00   0.00000E+00
184   1   0.00000E+00   0.00000E+00   1.43420E+00   0.00000E+00   0.00000E+00   0.00000E+00
186   1   0.00000E+00   0.00000E+00   7.54133E-01   0.00000E+00   0.00000E+00   0.00000E+00
188   1   0.00000E+00   0.00000E+00   4.22365E-01   0.00000E+00   0.00000E+00   0.00000E+00
190   1   0.00000E+00   0.00000E+00   3.39020E-01   0.00000E+00   0.00000E+00   0.00000E+00
192   1   0.00000E+00   0.00000E+00   6.22564E-01   0.00000E+00   0.00000E+00   0.00000E+00
194   1   0.00000E+00   0.00000E+00   5.44573E-01   0.00000E+00   0.00000E+00   0.00000E+00
196   1   0.00000E+00   0.00000E+00   4.34534E-01   0.00000E+00   0.00000E+00   0.00000E+00
198   1   0.00000E+00   0.00000E+00   3.32052E-01   0.00000E+00   0.00000E+00   0.00000E+00
200   1   0.00000E+00   0.00000E+00   2.42030E-01   0.00000E+00   0.00000E+00   0.00000E+00
202   1   0.00000E+00   0.00000E+00   2.24132E-01   0.00000E+00   0.00000E+00   0.00000E+00
204   1   0.00000E+00   0.00000E+00   2.74316E-01   0.00000E+00   0.00000E+00   0.00000E+00
206   1   0.00000E+00   0.00000E+00   3.73555E-01   0.00000E+00   0.00000E+00   0.00000E+00
208   1   0.00000E+00   0.00000E+00   4.69850E-01   0.00000E+00   0.00000E+00   0.00000E+00
210   1   0.00000E+00   0.00000E+00   6.02833E-01   0.00000E+00   0.00000E+00   0.00000E+00
212   1   0.00000E+00   0.00000E+00   7.34775E-01   0.00000E+00   0.00000E+00   0.00000E+00
214   1   0.00000E+00   0.00000E+00   8.47535E-01   0.00000E+00   0.00000E+00   0.00000E+00
216   1   0.00000E+00   0.00000E+00   9.79730E-01   0.00000E+00   0.00000E+00   0.00000E+00
218   1   0.00000E+00   0.00000E+00   5.28587E-01   0.00000E+00   0.00000E+00   0.00000E+00
220   1   0.00000E+00   0.00000E+00   2.94112E-01   0.00000E+00   0.00000E+00   0.00000E+00
222   1   0.00000E+00   0.00000E+00   5.30805E-01   0.00000E+00   0.00000E+00   0.00000E+00
224   1   0.00000E+00   0.00000E+00   6.03236E-01   0.00000E+00   0.00000E+00   0.00000E+00
226   1   0.00000E+00   0.00000E+00   6.53403E-01   0.00000E+00   0.00000E+00   0.00000E+00
228   1   0.00000E+00   0.00000E+00   5.91709E-01   0.00000E+00   0.00000E+00   0.00000E+00
230   1   0.00000E+00   0.00000E+00   5.10245E-01   0.00000E+00   0.00000E+00   0.00000E+00
232   1   0.00000E+00   0.00000E+00   4.25330E-01   0.00000E+00   0.00000E+00   0.00000E+00
234   1   0.00000E+00   0.00000E+00   3.29933E-01   0.00000E+00   0.00000E+00   0.00000E+00
236   1   0.00000E+00   0.00000E+00   2.24132E-01   0.00000E+00   0.00000E+00   0.00000E+00
238   1   0.00000E+00   0.00000E+00   2.21426E-01   0.00000E+00   0.00000E+00   0.00000E+00
240   1   0.00000E+00   0.00000E+00   2.63334E-01   0.00000E+00   0.00000E+00   0.00000E+00
242   1   0.00000E+00   0.00000E+00   3.73583E-01   0.00000E+00   0.00000E+00   0.00000E+00
244   1   0.00000E+00   0.00000E+00   4.69830E-01   0.00000E+00   0.00000E+00   0.00000E+00
246   1   0.00000E+00   0.00000E+00   5.95038E-01   0.00000E+00   0.00000E+00   0.00000E+00
248   1   0.00000E+00   0.00000E+00   7.04475E-01   0.00000E+00   0.00000E+00   0.00000E+00
250   1   0.00000E+00   0.00000E+00   8.29833E-01   0.00000E+00   0.00000E+00   0.00000E+00
252   1   0.00000E+00   0.00000E+00   9.39300E-01   0.00000E+00   0.00000E+00   0.00000E+00
254   1   0.00000E+00   0.00000E+00   4.37667E-01   0.00000E+00   0.00000E+00   0.00000E+00
```

```
   256     1     0.00000E+00     0.00000E+00     4.41168E-01     0.00000E+00     0.00000E+00     0.00000E+00
   258     1     0.00000E+00     0.00000E+00     8.73852E-01     0.00000E+00     0.00000E+00     0.00000E+00
   260     1     0.00000E+00     0.00000E+00     8.42744E-01     0.00000E+00     0.00000E+00     0.00000E+00
   262     1     0.00000E+00     0.00000E+00     7.89012E-01     0.00000E+00     0.00000E+00     0.00000E+00
   264     1     0.00000E+00     0.00000E+00     7.15484E-01     0.00000E+00     0.00000E+00     0.00000E+00
   266     1     0.00000E+00     0.00000E+00     6.24988E-01     0.00000E+00     0.00000E+00     0.00000E+00
   268     1     0.00000E+00     0.00000E+00     5.20352E-01     0.00000E+00     0.00000E+00     0.00000E+00
   270     1     0.00000E+00     0.00000E+00     4.01578E-01     0.00000E+00     0.00000E+00     0.00000E+00
   272     1     0.00000E+00     0.00000E+00     2.74316E-01     0.00000E+00     0.00000E+00     0.00000E+00
   274     1     0.00000E+00     0.00000E+00     2.83004E-01     0.00000E+00     0.00000E+00     0.00000E+00
   276     1     0.00000E+00     0.00000E+00     3.16736E-01     0.00000E+00     0.00000E+00     0.00000E+00
   278     1     0.00000E+00     0.00000E+00     4.41168E-01     0.00000E+00     0.00000E+00     0.00000E+00
   280     1     0.00000E+00     0.00000E+00     5.65600E-01     0.00000E+00     0.00000E+00     0.00000E+00
   282     1     0.00000E+00     0.00000E+00     7.07000E-01     0.00000E+00     0.00000E+00     0.00000E+00
   284     1     0.00000E+00     0.00000E+00     8.48400E-01     0.00000E+00     0.00000E+00     0.00000E+00
   286     1     0.00000E+00     0.00000E+00     9.89800E-01     0.00000E+00     0.00000E+00     0.00000E+00
   288     1     0.00000E+00     0.00000E+00     1.13120E+00     0.00000E+00     0.00000E+00     0.00000E+00
   290     1     0.00000E+00     0.00000E+00     5.65600E-01     0.00000E+00     0.00000E+00     0.00000E+00
   292     1     0.00000E+00     0.00000E+00     6.72256E-01     0.00000E+00     0.00000E+00     0.00000E+00
   294     1     0.00000E+00     0.00000E+00     1.21604E+00     0.00000E+00     0.00000E+00     0.00000E+00
   296     1     0.00000E+00     0.00000E+00     1.17086E+00     0.00000E+00     0.00000E+00     0.00000E+00
   298     1     0.00000E+00     0.00000E+00     1.09491E+00     0.00000E+00     0.00000E+00     0.00000E+00
   300     1     0.00000E+00     0.00000E+00     9.91012E-01     0.00000E+00     0.00000E+00     0.00000E+00
   302     1     0.00000E+00     0.00000E+00     8.64223E-01     0.00000E+00     0.00000E+00     0.00000E+00
   304     1     0.00000E+00     0.00000E+00     7.17369E-01     0.00000E+00     0.00000E+00     0.00000E+00
   306     1     0.00000E+00     0.00000E+00     5.51191E-01     0.00000E+00     0.00000E+00     0.00000E+00
   308     1     0.00000E+00     0.00000E+00     3.73565E-01     0.00000E+00     0.00000E+00     0.00000E+00
   310     1     0.00000E+00     0.00000E+00     3.73365E-01     0.00000E+00     0.00000E+00     0.00000E+00
   312     1     0.00000E+00     0.00000E+00     4.41168E-01     0.00000E+00     0.00000E+00     0.00000E+00
   314     1     0.00000E+00     0.00000E+00     6.30779E-01     0.00000E+00     0.00000E+00     0.00000E+00
   316     1     0.00000E+00     0.00000E+00     7.87800E-01     0.00000E+00     0.00000E+00     0.00000E+00
   318     1     0.00000E+00     0.00000E+00     1.00327E+00     0.00000E+00     0.00000E+00     0.00000E+00
   320     1     0.00000E+00     0.00000E+00     1.18170E+00     0.00000E+00     0.00000E+00     0.00000E+00
   322     1     0.00000E+00     0.00000E+00     1.39717E+00     0.00000E+00     0.00000E+00     0.00000E+00
   324     1     0.00000E+00     0.00000E+00     1.57560E+00     0.00000E+00     0.00000E+00     0.00000E+00
   326     1     0.00000E+00     0.00000E+00     7.13733E-01     0.00000E+00     0.00000E+00     0.00000E+00
   328     1     0.00000E+00     0.00000E+00     7.87800E-01     0.00000E+00     0.00000E+00     0.00000E+00
   330     1     0.00000E+00     0.00000E+00     1.58045E+00     0.00000E+00     0.00000E+00     0.00000E+00
   332     1     0.00000E+00     0.00000E+00     1.50490E+00     0.00000E+00     0.00000E+00     0.00000E+00
   334     1     0.00000E+00     0.00000E+00     1.40895E+00     0.00000E+00     0.00000E+00     0.00000E+00
   336     1     0.00000E+00     0.00000E+00     1.27765E+00     0.00000E+00     0.00000E+00     0.00000E+00
   338     1     0.00000E+00     0.00000E+00     1.11605E+00     0.00000E+00     0.00000E+00     0.00000E+00
   340     1     0.00000E+00     0.00000E+00     9.29200E-01     0.00000E+00     0.00000E+00     0.00000E+00
   342     1     0.00000E+00     0.00000E+00     7.17100E-01     0.00000E+00     0.00000E+00     0.00000E+00
   344     1     0.00000E+00     0.00000E+00     4.89850E-01     0.00000E+00     0.00000E+00     0.00000E+00
   346     1     0.00000E+00     0.00000E+00     4.69850E-01     0.00000E+00     0.00000E+00     0.00000E+00
   348     1     0.00000E+00     0.00000E+00     5.65600E-01     0.00000E+00     0.00000E+00     0.00000E+00
   350     1     0.00000E+00     0.00000E+00     7.87800E-01     0.00000E+00     0.00000E+00     0.00000E+00
   352     1     0.00000E+00     0.00000E+00     1.01000E+00     0.00000E+00     0.00000E+00     0.00000E+00
   354     1     0.00000E+00     0.00000E+00     1.26250E+00     0.00000E+00     0.00000E+00     0.00000E+00
   356     1     0.00000E+00     0.00000E+00     1.51500E+00     0.00000E+00     0.00000E+00     0.00000E+00
   358     1     0.00000E+00     0.00000E+00     1.76750E+00     0.00000E+00     0.00000E+00     0.00000E+00
   360     1     0.00000E+00     0.00000E+00     2.02000E+00     0.00000E+00     0.00000E+00     0.00000E+00
   362     1     0.00000E+00     0.00000E+00     1.01000E+00     0.00000E+00     0.00000E+00     0.00000E+00
   364     1     0.00000E+00     0.00000E+00     1.05040E+00     0.00000E+00     0.00000E+00     0.00000E+00
   366     1     0.00000E+00     0.00000E+00     1.94950E+00     0.00000E+00     0.00000E+00     0.00000E+00
   368     1     0.00000E+00     0.00000E+00     1.87776E+00     0.00000E+00     0.00000E+00     0.00000E+00
   370     1     0.00000E+00     0.00000E+00     1.75656E+00     0.00000E+00     0.00000E+00     0.00000E+00
   372     1     0.00000E+00     0.00000E+00     1.59075E+00     0.00000E+00     0.00000E+00     0.00000E+00
   374     1     0.00000E+00     0.00000E+00     1.38791E+00     0.00000E+00     0.00000E+00     0.00000E+00
   376     1     0.00000E+00     0.00000E+00     1.15308E+00     0.00000E+00     0.00000E+00     0.00000E+00
   378     1     0.00000E+00     0.00000E+00     8.87117E-01     0.00000E+00     0.00000E+00     0.00000E+00
   380     1     0.00000E+00     0.00000E+00     6.02633E-01     0.00000E+00     0.00000E+00     0.00000E+00
   382     1     0.00000E+00     0.00000E+00     5.95058E-01     0.00000E+00     0.00000E+00     0.00000E+00
   384     1     0.00000E+00     0.00000E+00     7.07000E-01     0.00000E+00     0.00000E+00     0.00000E+00
   386     1     0.00000E+00     0.00000E+00     1.00327E+00     0.00000E+00     0.00000E+00     0.00000E+00
   388     1     0.00000E+00     0.00000E+00     1.26250E+00     0.00000E+00     0.00000E+00     0.00000E+00
   390     1     0.00000E+00     0.00000E+00     1.59917E+00     0.00000E+00     0.00000E+00     0.00000E+00
[illegible]     1     0.00000E+00     0.00000E+00     [illegible]     0.00000E+00     0.00000E+00     0.00000E+00
```

```
 392     1     0.00000E+00    0.00000E+00    1.39375E+00    0.00000E+00    0.00000E+00    0.00000E+00
 394     1     0.00000E+00    0.00000E+00    2.23042E+00    0.00000E+00    0.00000E+00    0.00000E+00
 396     1     0.00000E+00    0.00000E+00    2.52500E+00    0.00000E+00    0.00000E+00    0.00000E+00
 398     1     0.00000E+00    0.00000E+00    1.17833E+00    0.00000E+00    0.00000E+00    0.00000E+00
 400     1     0.00000E+00    0.00000E+00    1.18170E+00    0.00000E+00    0.00000E+00    0.00000E+00
 402     1     0.00000E+00    0.00000E+00    2.34067E+00    0.00000E+00    0.00000E+00    0.00000E+00
 404     1     0.00000E+00    0.00000E+00    2.25735E+00    0.00000E+00    0.00000E+00    0.00000E+00
 406     1     0.00000E+00    0.00000E+00    2.11343E+00    0.00000E+00    0.00000E+00    0.00000E+00
 408     1     0.00000E+00    0.00000E+00    1.91648E+00    0.00000E+00    0.00000E+00    0.00000E+00
 410     1     0.00000E+00    0.00000E+00    1.67407E+00    0.00000E+00    0.00000E+00    0.00000E+00
 412     1     0.00000E+00    0.00000E+00    1.39380E+00    0.00000E+00    0.00000E+00    0.00000E+00
 414     1     0.00000E+00    0.00000E+00    1.07565E+00    0.00000E+00    0.00000E+00    0.00000E+00
 416     1     0.00000E+00    0.00000E+00    7.34775E-01    0.00000E+00    0.00000E+00    0.00000E+00
 418     1     0.00000E+00    0.00000E+00    7.04475E-01    0.00000E+00    0.00000E+00    0.00000E+00
 420     1     0.00000E+00    0.00000E+00    6.48400E-01    0.00000E+00    0.00000E+00    0.00000E+00
 422     1     0.00000E+00    0.00000E+00    1.18170E+00    0.00000E+00    0.00000E+00    0.00000E+00
 424     1     0.00000E+00    0.00000E+00    1.51500E+00    0.00000E+00    0.00000E+00    0.00000E+00
 426     1     0.00000E+00    0.00000E+00    1.89375E+00    0.00000E+00    0.00000E+00    0.00000E+00
 428     1     0.00000E+00    0.00000E+00    2.27250E+00    0.00000E+00    0.00000E+00    0.00000E+00
 430     1     0.00000E+00    0.00000E+00    2.65125E+00    0.00000E+00    0.00000E+00    0.00000E+00
 432     1     0.00000E+00    0.00000E+00    3.03000E+00    0.00000E+00    0.00000E+00    0.00000E+00
 434     1     0.00000E+00    0.00000E+00    1.51500E+00    0.00000E+00    0.00000E+00    0.00000E+00
 436     1     0.00000E+00    0.00000E+00    1.44430E+00    0.00000E+00    0.00000E+00    0.00000E+00
 438     1     0.00000E+00    0.00000E+00    2.72952E+00    0.00000E+00    0.00000E+00    0.00000E+00
 440     1     0.00000E+00    0.00000E+00    2.63021E+00    0.00000E+00    0.00000E+00    0.00000E+00
 442     1     0.00000E+00    0.00000E+00    2.46103E+00    0.00000E+00    0.00000E+00    0.00000E+00
 444     1     0.00000E+00    0.00000E+00    2.22957E+00    0.00000E+00    0.00000E+00    0.00000E+00
 446     1     0.00000E+00    0.00000E+00    1.94593E+00    0.00000E+00    0.00000E+00    0.00000E+00
 448     1     0.00000E+00    0.00000E+00    1.61768E+00    0.00000E+00    0.00000E+00    0.00000E+00
 450     1     0.00000E+00    0.00000E+00    1.24567E+00    0.00000E+00    0.00000E+00    0.00000E+00
 452     1     0.00000E+00    0.00000E+00    6.47558E-01    0.00000E+00    0.00000E+00    0.00000E+00
 454     1     0.00000E+00    0.00000E+00    8.29883E-01    0.00000E+00    0.00000E+00    0.00000E+00
 456     1     0.00000E+00    0.00000E+00    9.69800E-01    0.00000E+00    0.00000E+00    0.00000E+00
 458     1     0.00000E+00    0.00000E+00    1.39717E+00    0.00000E+00    0.00000E+00    0.00000E+00
 460     1     0.00000E+00    0.00000E+00    1.76750E+00    0.00000E+00    0.00000E+00    0.00000E+00
 462     1     0.00000E+00    0.00000E+00    2.23042E+00    0.00000E+00    0.00000E+00    0.00000E+00
 464     1     0.00000E+00    0.00000E+00    2.65125E+00    0.00000E+00    0.00000E+00    0.00000E+00
 466     1     0.00000E+00    0.00000E+00    3.11417E+00    0.00000E+00    0.00000E+00    0.00000E+00
 468     1     0.00000E+00    0.00000E+00    3.53500E+00    0.00000E+00    0.00000E+00    0.00000E+00
 470     1     0.00000E+00    0.00000E+00    1.68333E+00    0.00000E+00    0.00000E+00    0.00000E+00
 472     1     0.00000E+00    0.00000E+00    1.57500E+00    0.00000E+00    0.00000E+00    0.00000E+00
 474     1     0.00000E+00    0.00000E+00    3.12090E+00    0.00000E+00    0.00000E+00    0.00000E+00
 476     1     0.00000E+00    0.00000E+00    3.00980E+00    0.00000E+00    0.00000E+00    0.00000E+00
 478     1     0.00000E+00    0.00000E+00    2.81790E+00    0.00000E+00    0.00000E+00    0.00000E+00
 480     1     0.00000E+00    0.00000E+00    2.55530E+00    0.00000E+00    0.00000E+00    0.00000E+00
 482     1     0.00000E+00    0.00000E+00    2.23210E+00    0.00000E+00    0.00000E+00    0.00000E+00
 484     1     0.00000E+00    0.00000E+00    1.85840E+00    0.00000E+00    0.00000E+00    0.00000E+00
 486     1     0.00000E+00    0.00000E+00    1.43420E+00    0.00000E+00    0.00000E+00    0.00000E+00
 488     1     0.00000E+00    0.00000E+00    9.79700E-01    0.00000E+00    0.00000E+00    0.00000E+00
 490     1     0.00000E+00    0.00000E+00    9.59300E-01    0.00000E+00    0.00000E+00    0.00000E+00
 492     1     0.00000E+00    0.00000E+00    1.15120E+00    0.00000E+00    0.00000E+00    0.00000E+00
 494     1     0.00000E+00    0.00000E+00    1.57500E+00    0.00000E+00    0.00000E+00    0.00000E+00
 496     1     0.00000E+00    0.00000E+00    2.02000E+00    0.00000E+00    0.00000E+00    0.00000E+00
 498     1     0.00000E+00    0.00000E+00    2.52500E+00    0.00000E+00    0.00000E+00    0.00000E+00
 500     1     0.00000E+00    0.00000E+00    3.03000E+00    0.00000E+00    0.00000E+00    0.00000E+00
 502     1     0.00000E+00    0.00000E+00    3.53500E+00    0.00000E+00    0.00000E+00    0.00000E+00
 504     1     0.00000E+00    0.00000E+00    4.04000E+00    0.00000E+00    0.00000E+00    0.00000E+00
 506     1     0.00000E+00    0.00000E+00    2.02000E+00    0.00000E+00    0.00000E+00    0.00000E+00
 508     1     0.00000E+00    0.00000E+00    5.25200E-01    0.00000E+00    0.00000E+00    0.00000E+00
 510     1     0.00000E+00    0.00000E+00    1.50550E+00    0.00000E+00    0.00000E+00    0.00000E+00
 512     1     0.00000E+00    0.00000E+00    1.51837E+00    0.00000E+00    0.00000E+00    0.00000E+00
 514     1     0.00000E+00    0.00000E+00    1.42747E+00    0.00000E+00    0.00000E+00    0.00000E+00
 516     1     0.00000E+00    0.00000E+00    1.30290E+00    0.00000E+00    0.00000E+00    0.00000E+00
 518     1     0.00000E+00    0.00000E+00    1.14467E+00    0.00000E+00    0.00000E+00    0.00000E+00
 520     1     0.00000E+00    0.00000E+00    9.62867E-01    0.00000E+00    0.00000E+00    0.00000E+00
 522     1     0.00000E+00    0.00000E+00    7.54133E-01    0.00000E+00    0.00000E+00    0.00000E+00
 524     1     0.00000E+00    0.00000E+00    5.28567E-01    0.00000E+00    0.00000E+00    0.00000E+00
 526     1     0.00000E+00    0.00000E+00    4.37667E-01    0.00000E+00    0.00000E+00    0.00000E+00
```

```
     528        1     0.00000E+00     0.00000E+00     5.05000E-01     0.00000E+00     0.00000E+00     0.00000E+00
     530        1     0.00000E+00     0.00000E+00     7.13733E-01     0.00000E+00     0.00000E+00     0.00000E+00
     532        1     0.00000E+00     0.00000E+00     1.01000E+00     0.00000E+00     0.00000E+00     0.00000E+00
     534        1     0.00000E+00     0.00000E+00     1.17833E+00     0.00000E+00     0.00000E+00     0.00000E+00
     536        1     0.00000E+00     0.00000E+00     1.51500E+00     0.00000E+00     0.00000E+00     0.00000E+00
     538        1     0.00000E+00     0.00000E+00     1.68333E+00     0.00000E+00     0.00000E+00     0.00000E+00
     540        1     0.00000E+00     0.00000E+00     2.02000E+00     0.00000E+00     0.00000E+00     0.00000E+00
     542        1     0.00000E+00     0.00000E+00     1.34667E+00     0.00000E+00     0.00000E+00     0.00000E+00
ALL EQUATIONS HAVE STIFFNESS ATTACHED


STRUCTURE                 ELEMENT    LOAD    MULTIPLIERS
LOAD CASE                   A          B          C          D

    1                     0.000      0.000      0.000      0.000

STIFFNESS MATRIX PARAMETERS

          MINIMUM NON-ZERO DIAGONAL ELEMENT= 5.857D+02
          MAXIMUM DIAGONAL ELEMENT         = 3.642D+03
          MAXIMUM/MINIMUM                  = 6.218D+00
          AVERAGE DIAGONAL ELEMENT         = 1.517D+03
          DENSITY OF THE MATRIX            = 16.5 PCT.

REQUIRED BLANK COMMON FOR THIS STEP=   4450
```

```
S T A T I C   A N A L Y S I S

LOAD CASE     1

DISPLACEMENTS/ROTATIONS OF UNRESTRAINED NODES

 NODE               X-             Y-             Z-             X-             Y-             Z-
NUMBER     TRANSLATION    TRANSLATION    TRANSLATION       ROTATION       ROTATION       ROTATION
     1    0.00000D+00   -1.67689D-01    5.09161D+00    0.00000D+00    0.00000D+00    0.00000D+00
     2    0.00000D+00    3.02440D-01    5.09161D+00    0.00000D+00    0.00000D+00    0.00000D+00
     3    0.00000D+00   -1.95331D-01    4.71631D+00    0.00000D+00    0.00000D+00    0.00000D+00
     4    0.00000D+00    4.74455D-01    4.71631D+00    0.00000D+00    0.00000D+00    0.00000D+00
     5    0.00000D+00   -2.21908D-01    4.33916D+00    0.00000D+00    0.00000D+00    0.00000D+00
     6    0.00000D+00    4.49594D-01    4.33916D+00    0.00000D+00    0.00000D+00    0.00000D+00
     7    0.00000D+00   -2.61663D-01    3.66115D+00    0.00000D+00    0.00000D+00    0.00000D+00
     8    0.00000D+00    4.09753D-01    3.66115D+00    0.00000D+00    0.00000D+00    0.00000D+00
     9    0.00000D+00   -2.86835D-01    2.98707D+00    0.00000D+00    0.00000D+00    0.00000D+00
    10    0.00000D+00    3.70619D-01    2.98707D+00    0.00000D+00    0.00000D+00    0.00000D+00
    11    0.00000D+00   -2.94924D-01    2.02039D+00    0.00000D+00    0.00000D+00    0.00000D+00
    12    0.00000D+00    3.12546D-01    2.02039D+00    0.00000D+00    0.00000D+00    0.00000D+00
    13    0.00000D+00   -2.56688D-01    1.16699D+00    0.00000D+00    0.00000D+00    0.00000D+00
    14    0.00000D+00    2.41815D-01    1.16699D+00    0.00000D+00    0.00000D+00    0.00000D+00
    15    0.00000D+00   -1.62715D-01    3.29374D-01    0.00000D+00    0.00000D+00    0.00000D+00
    16    0.00000D+00    1.40303D-01    3.29374D-01    0.00000D+00    0.00000D+00    0.00000D+00
    19   -1.66763D-02   -1.64930D-01    5.05863D+00    0.00000D+00    0.00000D+00    0.00000D+00
    20    2.33547D-02    4.90810D-01    5.05863D+00    0.00000D+00    0.00000D+00    0.00000D+00
    21   -1.22233D-02   -1.93300D-01    4.69033D+00    0.00000D+00    0.00000D+00    0.00000D+00
    22    2.39403D-02    4.64080D-01    4.69033D+00    0.00000D+00    0.00000D+00    0.00000D+00
    23   -7.27213D-03   -2.19884D-01    4.31936D+00    0.00000D+00    0.00000D+00    0.00000D+00
    24    2.22842D-02    4.40025D-01    4.31936D+00    0.00000D+00    0.00000D+00    0.00000D+00
    25   -4.85876D-04   -2.59682D-01    3.65206D+00    0.00000D+00    0.00000D+00    0.00000D+00
    26    1.77612D-02    4.01369D-01    3.65206D+00    0.00000D+00    0.00000D+00    0.00000D+00
    27    4.47065D-03   -2.64722D-01    2.98723D+00    0.00000D+00    0.00000D+00    0.00000D+00
    28    1.23706D-02    3.63559D-01    2.98723D+00    0.00000D+00    0.00000D+00    0.00000D+00
    29    8.73618D-03   -2.93950D-01    2.03022D+00    0.00000D+00    0.00000D+00    0.00000D+00
    30    6.04671D-03    3.07469D-01    2.03022D+00    0.00000D+00    0.00000D+00    0.00000D+00
    31    9.90030D-03   -2.50762D-01    1.18151D+00    0.00000D+00    0.00000D+00    0.00000D+00
    32    1.56654D-03    2.38880D-01    1.18151D+00    0.00000D+00    0.00000D+00    0.00000D+00
    33    7.20002D-03   -1.65540D-01    3.40514D-01    0.00000D+00    0.00000D+00    0.00000D+00
    34   -5.77474D-04    1.41068D-01    3.40514D-01    0.00000D+00    0.00000D+00    0.00000D+00
    37   -4.53903D-02   -1.44173D-01    5.18579D+00    0.00000D+00    0.00000D+00    0.00000D+00
    38    3.54589D-02    4.72585D-01    5.18579D+00    0.00000D+00    0.00000D+00    0.00000D+00
    39   -3.85814D-02   -1.64415D-01    4.95523D+00    0.00000D+00    0.00000D+00    0.00000D+00
    40    5.55601D-02    4.55605D-01    4.95523D+00    0.00000D+00    0.00000D+00    0.00000D+00
    41   -2.67435D-02   -1.94260D-01    4.60367D+00    0.00000D+00    0.00000D+00    0.00000D+00
    42    3.33710D-02    4.32961D-01    4.60367D+00    0.00000D+00    0.00000D+00    0.00000D+00
    43   -1.99319D-02   -2.21176D-01    4.24758D+00    0.00000D+00    0.00000D+00    0.00000D+00
    44    3.00043D-02    4.12134D-01    4.24758D+00    0.00000D+00    0.00000D+00    0.00000D+00
    45   -3.34024D-03   -2.60496D-01    3.60413D+00    0.00000D+00    0.00000D+00    0.00000D+00
    46    4.15832D-02    3.78264D-01    3.60413D+00    0.00000D+00    0.00000D+00    0.00000D+00
    47   -9.41597D-03   -2.84810D-01    2.96007D+00    0.00000D+00    0.00000D+00    0.00000D+00
    48    3.26972D-02    3.44628D-01    2.96007D+00    0.00000D+00    0.00000D+00    0.00000D+00
    49    7.67508D-03   -2.94179D-01    2.02736D+00    0.00000D+00    0.00000D+00    0.00000D+00
    50    1.99863D-02    2.34755D-01    2.02736D+00    0.00000D+00    0.00000D+00    0.00000D+00
    51    1.06792D-02   -2.60397D-01    1.19222D+00    0.00000D+00    0.00000D+00    0.00000D+00
    52    1.03963D-02    2.32260D-01    1.19222D+00    0.00000D+00    0.00000D+00    0.00000D+00
    53    3.41764D-03   -1.69173D-01    3.52199D-01    0.00000D+00    0.00000D+00    0.00000D+00
    54    3.16174D-03    1.41028D-01    3.52199D-01    0.00000D+00    0.00000D+00    0.00000D+00
    57   -8.77259D-02   -1.11456D-01    5.32787D+00    0.00000D+00    0.00000D+00    0.00000D+00
    58    9.85033D-02    4.38009D-01    5.32787D+00    0.00000D+00    0.00000D+00    0.00000D+00
    59   -7.02375D-02   -1.47703D-01    4.98855D+00    0.00000D+00    0.00000D+00    0.00000D+00
    60    9.46781D-02    4.15769D-01    4.98855D+00    0.00000D+00    0.00000D+00    0.00000D+00
    61   -8.11568D-02   -1.69224D-01    4.77662D+00    0.00000D+00    0.00000D+00    0.00000D+00
    62    9.27146D-02    4.03591D-01    4.77662D+00    0.00000D+00    0.00000D+00    0.00000D+00
    63   -4.81759D-02   -1.99163D-01    4.44909D+00    0.00000D+00    0.00000D+00    0.00000D+00
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
  65   -3.72117D-02   -2.25297D-01    4.11456D+00    0.00000D+00    0.00000D+00    0.00000D+00
  66    8.05584D-02    3.70524D-01    4.11456D+00    0.00000D+00    0.00000D+00    0.00000D+00
  67   -2.21741D-02   -2.02584D-01    3.50566D+00    0.00000D+00    0.00000D+00    0.00000D+00
  68    6.77459D-02    3.43837D-01    3.50566D+00    0.00000D+00    0.00000D+00    0.00000D+00
  69   -1.10216D-02   -2.55050D-01    2.89166D+00    0.00000D+00    0.00000D+00    0.00000D+00
  70    5.45535D-02    3.10465D-01    2.89166D+00    0.00000D+00    0.00000D+00    0.00000D+00
  71    3.23040D-04   -2.93194D-01    1.99576D+00    0.00000D+00    0.00000D+00    0.00000D+00
  72    3.58932D-02    2.75122D-01    1.99576D+00    0.00000D+00    0.00000D+00    0.00000D+00
  73    6.55134D-03   -2.30292D-01    1.18474D+00    0.00000D+00    0.00000D+00    0.00000D+00
   74    2.06898D-02    2.20776D-01    1.18474D+00    0.00000D+00    0.00000D+00    0.00000D+00
  75    7.10561D-03   -1.70703D-01    3.56717D-01    0.00000D+00    0.00000D+00    0.00000D+00
  76    7.61722D-03    1.36021D-01    3.56717D-01    0.00000D+00    0.00000D+00    0.00000D+00
  79   -1.40391D-01   -6.60852D-02    5.41814D+00    0.00000D+00    0.00000D+00    0.00000D+00
  80    1.50303D-01    3.84006D-01    5.41814D+00    0.00000D+00    0.00000D+00    0.00000D+00
  81   -1.11302D-01   -1.19376D-01    5.02561D+00    0.00000D+00    0.00000D+00    0.00000D+00
  82    1.38601D-01    3.62917D-01    5.02561D+00    0.00000D+00    0.00000D+00    0.00000D+00
  83   -9.43069D-02   -1.56636D-01    4.72571D+00    0.00000D+00    0.00000D+00    0.00000D+00
  84    1.33120D-01    3.31028D-01    4.72571D+00    0.00000D+00    0.00000D+00    0.00000D+00
  85   -8.35228D-02   -1.77122D-01    4.53356D+00    0.00000D+00    0.00000D+00    0.00000D+00
  86    1.27502D-01    3.43336D-01    4.53356D+00    0.00000D+00    0.00000D+00    0.00000D+00
  87   -6.95092D-02   -2.05184D-01    4.23390D+00    0.00000D+00    0.00000D+00    0.00000D+00
  88    1.18739D-01    3.32591D-01    4.23390D+00    0.00000D+00    0.00000D+00    0.00000D+00
  89   -5.75612D-02   -2.29288D-01    3.92512D+00    0.00000D+00    0.00000D+00    0.00000D+00
  90    1.09534D-01    3.22000D-01    3.92512D+00    0.00000D+00    0.00000D+00    0.00000D+00
  91   -4.00146D-02   -2.63179D-01    3.35827D+00    0.00000D+00    0.00000D+00    0.00000D+00
  92    9.24933D-02    3.03624D-01    3.35827D+00    0.00000D+00    0.00000D+00    0.00000D+00
  93   -2.61921D-02   -2.83133D-01    2.78159D+00    0.00000D+00    0.00000D+00    0.00000D+00
  94    7.51708D-02    2.83512D-01    2.78159D+00    0.00000D+00    0.00000D+00    0.00000D+00
  95   -1.05494D-02   -2.69302D-01    1.93306D+00    0.00000D+00    0.00000D+00    0.00000D+00
  96    5.08563D-02    2.51512D-01    1.93306D+00    0.00000D+00    0.00000D+00    0.00000D+00
  97   -6.30863D-04   -2.37023D-01    1.15660D+00    0.00000D+00    0.00000D+00    0.00000D+00
  98    3.01387D-02    2.05908D-01    1.15660D+00    0.00000D+00    0.00000D+00    0.00000D+00
  99    4.28093D-03   -1.69508D-01    3.53314D-01    0.00000D+00    0.00000D+00    0.00000D+00
 100    1.12853D-02    1.32391D-01    3.53314D-01    0.00000D+00    0.00000D+00    0.00000D+00
 103   -1.96701D-01   -1.08576D-02    5.40112D+00    0.00000D+00    0.00000D+00    0.00000D+00
 104    2.03609D-01    3.14377D-01    5.40112D+00    0.00000D+00    0.00000D+00    0.00000D+00
 105   -1.60188D-01   -6.06403D-02    5.02594D+00    0.00000D+00    0.00000D+00    0.00000D+00
 106    1.84287D-01    3.03451D-01    5.02594D+00    0.00000D+00    0.00000D+00    0.00000D+00
 107   -1.34873D-01   -1.32279D-01    4.69188D+00    0.00000D+00    0.00000D+00    0.00000D+00
 108    1.74160D-01    2.94371D-01    4.69188D+00    0.00000D+00    0.00000D+00    0.00000D+00
 109   -1.15799D-01   -1.64906D-01    4.42543D+00    0.00000D+00    0.00000D+00    0.00000D+00
 110    1.62801D-01    2.88647D-01    4.42543D+00    0.00000D+00    0.00000D+00    0.00000D+00
 111   -1.05525D-01   -1.83314D-01    4.25276D+00    0.00000D+00    0.00000D+00    0.00000D+00
 112    1.55719D-01    2.65343D-01    4.25276D+00    0.00000D+00    0.00000D+00    0.00000D+00
 113   -9.14712D-02   -2.08497D-01    3.98139D+00    0.00000D+00    0.00000D+00    0.00000D+00
 114    1.44856D-01    2.60267D-01    3.98139D+00    0.00000D+00    0.00000D+00    0.00000D+00
 115   -7.89646D-02   -2.30060D-01    3.69939D+00    0.00000D+00    0.00000D+00    0.00000D+00
 116    1.33601D-01    2.74772D-01    3.69939D+00    0.00000D+00    0.00000D+00    0.00000D+00
 117   -5.94040D-02   -2.60111D-01    3.17738D+00    0.00000D+00    0.00000D+00    0.00000D+00
 118    1.13189D-01    2.64068D-01    3.17738D+00    0.00000D+00    0.00000D+00    0.00000D+00
 119   -4.31388D-02   -2.77543D-01    2.64150D+00    0.00000D+00    0.00000D+00    0.00000D+00
 120    9.25206D-02    2.50743D-01    2.64150D+00    0.00000D+00    0.00000D+00    0.00000D+00
 121   -2.34365D-02   -2.51734D-01    1.84639D+00    0.00000D+00    0.00000D+00    0.00000D+00
 122    6.34460D-02    2.27283D-01    1.84639D+00    0.00000D+00    0.00000D+00    0.00000D+00
 123   -9.37776D-03   -2.33241D-01    1.11103D+00    0.00000D+00    0.00000D+00    0.00000D+00
 124    3.80824D-02    1.39760D-01    1.11103D+00    0.00000D+00    0.00000D+00    0.00000D+00
 125    5.02190D-04   -1.65480D-01    3.43221D-01    0.00000D+00    0.00000D+00    0.00000D+00
 126    1.40712D-02    1.25047D-01    3.43221D-01    0.00000D+00    0.00000D+00    0.00000D+00
 129   -2.47008D-01    2.50128D-02    5.25782D+00    0.00000D+00    0.00000D+00    0.00000D+00
 130    2.49158D-01    2.37497D-01    5.25782D+00    0.00000D+00    0.00000D+00    0.00000D+00
 131   -2.11473D-01   -3.83969D-02    4.95966D+00    0.00000D+00    0.00000D+00    0.00000D+00
 132    2.26563D-01    2.52030D-01    4.95966D+00    0.00000D+00    0.00000D+00    0.00000D+00
 133   -1.80261D-01   -9.09375D-02    4.64803D+00    0.00000D+00    0.00000D+00    0.00000D+00
 134    2.12456D-01    2.37061D-01    4.64803D+00    0.00000D+00    0.00000D+00    0.00000D+00
 135   -1.53662D-01   -1.39250D-01    4.35554D+00    0.00000D+00    0.00000D+00    0.00000D+00
 136    1.96625D-01    2.30165D-01    4.35554D+00    0.00000D+00    0.00000D+00    0.00000D+00
 137   -1.36279D-01   -1.60430D-01    4.11880D+00    0.00000D+00    0.00000D+00    0.00000D+00
```

```
139   -1.20342D-01   -1.34778D-01    3.96406D+00    0.00000D+00    0.00000D+00    0.00000D+00
140    1.76592D-01    2.36397D-01    3.96406D+00    0.00000D+00    0.00000D+00    0.00000D+00
141   -1.12162D-01   -2.07195D-01    3.71906D+00    0.00000D+00    0.00000D+00    0.00000D+00
142    1.64390D-01    2.35647D-01    3.71906D+00    0.00000D+00    0.00000D+00    0.00000D+00
143   -9.91111D-02   -2.26497D-01    3.46245D+00    0.00000D+00    0.00000D+00    0.00000D+00
144    1.51765D-01    2.34094D-01    3.46245D+00    0.00000D+00    0.00000D+00    0.00000D+00
145   -7.78295D-02   -2.33165D-01    2.98385D+00    0.00000D+00    0.00000D+00    0.00000D+00
146    1.29061D-01    2.29358D-01    2.98385D+00    0.00000D+00    0.00000D+00    0.00000D+00
147   -3.94025D-02   -2.68579D-01    2.48833D+00    0.00000D+00    0.00000D+00    0.00000D+00
148    1.65907D-01    2.21525D-01    2.48833D+00    0.00000D+00    0.00000D+00    0.00000D+00
149   -3.60533D-02   -2.71257D-01    1.74742D+00    0.00000D+00    0.00000D+00    0.00000D+00
150    7.31757D-02    2.04932D-01    1.74742D+00    0.00000D+00    0.00000D+00    0.00000D+00
151   -1.81837D-02   -2.40900D-01    1.05689D+00    0.00000D+00    0.00000D+00    0.00000D+00
152    4.41652D-02    1.74183D-01    1.05689D+00    0.00000D+00    0.00000D+00    0.00000D+00
153   -3.56405D-03   -1.59413D-01    3.28611D-01    0.00000D+00    0.00000D+00    0.00000D+00
154    1.61141D-02    1.17349D-01    3.28611D-01    0.00000D+00    0.00000D+00    0.00000D+00
157   -2.83175D-01    4.65833D-02    5.03050D+00    0.00000D+00    0.00000D+00    0.00000D+00
158    2.79673D-01    1.02695D-01    5.03050D+00    0.00000D+00    0.00000D+00    0.00000D+00
159   -2.56591D-01   -1.20161D-03    4.83348D+00    0.00000D+00    0.00000D+00    0.00000D+00
160    2.59247D-01    1.74963D-01    4.83348D+00    0.00000D+00    0.00000D+00    0.00000D+00
161   -2.25327D-01   -3.64669D-02    4.58536D+00    0.00000D+00    0.00000D+00    0.00000D+00
162    2.43777D-01    1.64517D-01    4.58536D+00    0.00000D+00    0.00000D+00    0.00000D+00
163   -1.94636D-01   -1.03756D-01    4.31292D+00    0.00000D+00    0.00000D+00    0.00000D+00
164    2.27101D-01    1.89157D-01    4.31292D+00    0.00000D+00    0.00000D+00    0.00000D+00
165   -1.70534D-01   -1.41302D-01    4.05334D+00    0.00000D+00    0.00000D+00    0.00000D+00
166    2.11767D-01    1.93959D-01    4.05334D+00    0.00000D+00    0.00000D+00    0.00000D+00
167   -1.55633D-01   -1.67162D-01    3.84124D+00    0.00000D+00    0.00000D+00    0.00000D+00
168    1.99031D-01    1.97501D-01    3.84124D+00    0.00000D+00    0.00000D+00    0.00000D+00
169   -1.43724D-01   -1.61995D-01    3.70140D+00    0.00000D+00    0.00000D+00    0.00000D+00
170    1.90647D-01    1.99401D-01    3.70140D+00    0.00000D+00    0.00000D+00    0.00000D+00
171   -1.29283D-01   -2.02311D-01    3.47869D+00    0.00000D+00    0.00000D+00    0.00000D+00
172    1.77700D-01    2.01436D-01    3.47869D+00    0.00000D+00    0.00000D+00    0.00000D+00
173   -1.15693D-01   -2.19957D-01    3.24389D+00    0.00000D+00    0.00000D+00    0.00000D+00
174    1.64290D-01    2.02558D-01    3.24389D+00    0.00000D+00    0.00000D+00    0.00000D+00
175   -9.29656D-02   -2.44039D-01    2.80315D+00    0.00000D+00    0.00000D+00    0.00000D+00
176    1.39902D-01    2.01827D-01    2.80315D+00    0.00000D+00    0.00000D+00    0.00000D+00
177   -7.27163D-02   -2.38103D-01    2.34346D+00    0.00000D+00    0.00000D+00    0.00000D+00
178    1.15106D-01    1.97969D-01    2.34346D+00    0.00000D+00    0.00000D+00    0.00000D+00
179   -4.63701D-02   -2.59846D-01    1.65148D+00    0.00000D+00    0.00000D+00    0.00000D+00
180    7.97075D-02    1.66349D-01    1.65148D+00    0.00000D+00    0.00000D+00    0.00000D+00
181   -2.54266D-02   -2.30887D-01    1.00195D+00    0.00000D+00    0.00000D+00    0.00000D+00
182    4.61305D-02    1.60840D-01    1.00195D+00    0.00000D+00    0.00000D+00    0.00000D+00
183   -7.02303D-03   -1.52716D-01    3.12521D-01    0.00000D+00    0.00000D+00    0.00000D+00
184    1.73219D-02    1.09637D-01    3.12521D-01    0.00000D+00    0.00000D+00    0.00000D+00
187   -3.03727D-01    4.92615D-02    4.78891D+00    0.00000D+00    0.00000D+00    0.00000D+00
188    2.95356D-01    9.00605D-02    4.78891D+00    0.00000D+00    0.00000D+00    0.00000D+00
189   -2.89225D-01    2.49269D-02    4.68671D+00    0.00000D+00    0.00000D+00    0.00000D+00
190    2.83066D-01    1.23140D-01    4.68671D+00    0.00000D+00    0.00000D+00    0.00000D+00
191   -2.64071D-01   -1.77132D-02    4.51778D+00    0.00000D+00    0.00000D+00    0.00000D+00
192    2.65641D-01    1.40031D-01    4.51778D+00    0.00000D+00    0.00000D+00    0.00000D+00
193   -2.34050D-01   -6.41725D-02    4.29743D+00    0.00000D+00    0.00000D+00    0.00000D+00
194    2.51078D-01    1.35520D-01    4.29743D+00    0.00000D+00    0.00000D+00    0.00000D+00
195   -2.05709D-01   -1.06442D-01    4.05193D+00    0.00000D+00    0.00000D+00    0.00000D+00
196    2.35713D-01    1.38862D-01    4.05193D+00    0.00000D+00    0.00000D+00    0.00000D+00
197   -1.82637D-01   -1.43171D-01    3.81602D+00    0.00000D+00    0.00000D+00    0.00000D+00
198    2.20311D-01    1.63893D-01    3.81602D+00    0.00000D+00    0.00000D+00    0.00000D+00
199   -1.66097D-01   -1.63796D-01    3.62180D+00    0.00000D+00    0.00000D+00    0.00000D+00
200    2.07710D-01    1.71108D-01    3.62180D+00    0.00000D+00    0.00000D+00    0.00000D+00
201   -1.56159D-01   -1.77553D-01    3.49313D+00    0.00000D+00    0.00000D+00    0.00000D+00
202    1.99192D-01    1.74133D-01    3.49313D+00    0.00000D+00    0.00000D+00    0.00000D+00
203   -1.41452D-01   -1.96363D-01    3.28731D+00    0.00000D+00    0.00000D+00    0.00000D+00
204    1.85844D-01    1.77690D-01    3.28731D+00    0.00000D+00    0.00000D+00    0.00000D+00
205   -1.27369D-01   -2.12961D-01    3.06925D+00    0.00000D+00    0.00000D+00    0.00000D+00
206    1.71938D-01    1.80429D-01    3.06925D+00    0.00000D+00    0.00000D+00    0.00000D+00
207   -1.03485D-01   -2.35182D-01    2.65776D+00    0.00000D+00    0.00000D+00    0.00000D+00
208    1.46402D-01    1.82103D-01    2.65776D+00    0.00000D+00    0.00000D+00    0.00000D+00
209   -8.17608D-02   -2.48460D-01    2.22621D+00    0.00000D+00    0.00000D+00    0.00000D+00
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
 211    -5.31316D-02  -2.49752D-01   1.57287D+00   0.00000D+00   0.00000D+00   0.00000D+00
 212     8.30536D-02   1.72574D-01   1.57287D+00   0.00000D+00   0.00000D+00   0.00000D+00
 213    -2.99735D-02  -2.22194D-01   9.56217D-01   0.00000D+00   0.00000D+00   0.00000D+00
 214     4.98093D-02   1.50807D-01   9.56217D-01   0.00000D+00   0.00000D+00   0.00000D+00
 215    -9.09170D-03  -1.46896D-01   2.98387D-01   0.00000D+00   0.00000D+00   0.00000D+00
 216     1.74592D-02   1.03672D-01   2.98367D-01   0.00000D+00   0.00000D+00   0.00000D+00
 219    -3.17035D-01   0.00000D+00   4.60973D+00   0.00000D+00   0.00000D+00   0.00000D+00
 220     3.03507D-01   0.00000D+00   4.60973D+00   0.00000D+00   0.00000D+00   0.00000D+00
 221    -3.13638D-01   2.75622D-02   4.60296D+00   0.00000D+00   0.00000D+00   0.00000D+00
 222     3.01483D-01   3.89347D-02   4.60296D+00   0.00000D+00   0.00000D+00   0.00000D+00
 223    -3.08095D-01   3.30461D-02   4.56612D+00   0.00000D+00   0.00000D+00   0.00000D+00
 224     2.91699D-01   7.82404D-02   4.56612D+00   0.00000D+00   0.00000D+00   0.00000D+00
 225    -2.92819D-01   1.34132D-02   4.47439D+00   0.00000D+00   0.00000D+00   0.00000D+00
 226     2.79832D-01   1.03711D-01   4.47439D+00   0.00000D+00   0.00000D+00   0.00000D+00
 227    -2.67931D-01  -2.50029D-02   4.31948D+00   0.00000D+00   0.00000D+00   0.00000D+00
 228     2.67576D-01   1.20337D-01   4.31948D+00   0.00000D+00   0.00000D+00   0.00000D+00
 229    -2.39105D-01  -6.77227D-02   4.11498D+00   0.00000D+00   0.00000D+00   0.00000D+00
 230     2.54273D-01   1.32176D-01   4.11498D+00   0.00000D+00   0.00000D+00   0.00000D+00
 231    -2.11675D-01  -1.06981D-01   3.88535D+00   0.00000D+00   0.00000D+00   0.00000D+00
 232     2.39510D-01   1.41699D-01   3.88535D+00   0.00000D+00   0.00000D+00   0.00000D+00
 233    -1.89540D-01  -1.38508D-01   3.66342D+00   0.00000D+00   0.00000D+00   0.00000D+00
 234     2.24664D-01   1.49942D-01   3.66342D+00   0.00000D+00   0.00000D+00   0.00000D+00
 235    -1.73305D-01  -1.60761D-01   3.48010D+00   0.00000D+00   0.00000D+00   0.00000D+00
 236     2.12054D-01   1.55859D-01   3.48010D+00   0.00000D+00   0.00000D+00   0.00000D+00
 237    -1.63369D-01  -1.73817D-01   3.35856D+00   0.00000D+00   0.00000D+00   0.00000D+00
 238     2.03581D-01   1.59345D-01   3.35856D+00   0.00000D+00   0.00000D+00   0.00000D+00
 239    -1.48497D-01  -1.91703D-01   3.16332D+00   0.00000D+00   0.00000D+00   0.00000D+00
 240     1.90030D-01   1.63633D-01   3.16332D+00   0.00000D+00   0.00000D+00   0.00000D+00
 241    -1.33977D-01  -2.07526D-01   2.95605D+00   0.00000D+00   0.00000D+00   0.00000D+00
 242     1.75743D-01   1.67136D-01   2.95605D+00   0.00000D+00   0.00000D+00   0.00000D+00
 243    -1.09276D-01  -2.28803D-01   2.56317D+00   0.00000D+00   0.00000D+00   0.00000D+00
 244     1.49429D-01   1.70180D-01   2.56317D+00   0.00000D+00   0.00000D+00   0.00000D+00
 245    -8.64763D-02  -2.41626D-01   2.14988D+00   0.00000D+00   0.00000D+00   0.00000D+00
 246     1.22501D-01   1.70352D-01   2.14988D+00   0.00000D+00   0.00000D+00   0.00000D+00
 247    -5.63344D-02  -2.42841D-01   1.52153D+00   0.00000D+00   0.00000D+00   0.00000D+00
 248     8.39613D-02   1.64101D-01   1.52153D+00   0.00000D+00   0.00000D+00   0.00000D+00
 249    -3.16133D-02  -2.16347D-01   9.26271D-01   0.00000D+00   0.00000D+00   0.00000D+00
 250     4.97282D-02   1.44620D-01   9.26271D-01   0.00000D+00   0.00000D+00   0.00000D+00
 251    -9.67965D-03  -1.43072D-01   2.88907D-01   0.00000D+00   0.00000D+00   0.00000D+00
 252     1.08311D-02   1.00367D-01   2.88907D-01   0.00000D+00   0.00000D+00   0.00000D+00
 255    -3.25597D-01   0.00000D+00   4.26250D+00   0.00000D+00   0.00000D+00   0.00000D+00
 256     2.94871D-01   0.00000D+00   4.26250D+00   0.00000D+00   0.00000D+00   0.00000D+00
 257    -3.22139D-01   1.82618D-02   4.25810D+00   0.00000D+00   0.00000D+00   0.00000D+00
 258     2.93144D-01   2.62946D-02   4.25810D+00   0.00000D+00   0.00000D+00   0.00000D+00
 259    -3.14622D-01   2.04477D-02   4.22856D+00   0.00000D+00   0.00000D+00   0.00000D+00
 260     2.86801D-01   5.08283D-02   4.22856D+00   0.00000D+00   0.00000D+00   0.00000D+00
 261    -2.96014D-01   6.01634D-04   4.15063D+00   0.00000D+00   0.00000D+00   0.00000D+00
 262     2.79390D-01   7.60024D-02   4.15063D+00   0.00000D+00   0.00000D+00   0.00000D+00
 263    -2.73645D-01  -3.33141D-02   4.01535D+00   0.00000D+00   0.00000D+00   0.00000D+00
 264     2.69550D-01   9.47642D-02   4.01535D+00   0.00000D+00   0.00000D+00   0.00000D+00
 265    -2.46284D-01  -7.12497D-02   3.83350D+00   0.00000D+00   0.00000D+00   0.00000D+00
 266     2.57765D-01   1.07070D-01   3.83350D+00   0.00000D+00   0.00000D+00   0.00000D+00
 267    -2.20441D-01  -1.06429D-01   3.62681D+00   0.00000D+00   0.00000D+00   0.00000D+00
 268     2.43337D-01   1.18678D-01   3.62681D+00   0.00000D+00   0.00000D+00   0.00000D+00
 269    -1.98983D-01  -1.34898D-01   3.42544D+00   0.00000D+00   0.00000D+00   0.00000D+00
 270     2.29502D-01   1.27730D-01   3.42544D+00   0.00000D+00   0.00000D+00   0.00000D+00
 271    -1.83102D-01  -1.55074D-01   3.25829D+00   0.00000D+00   0.00000D+00   0.00000D+00
 272     2.17143D-01   1.34314D-01   3.25829D+00   0.00000D+00   0.00000D+00   0.00000D+00
 273    -1.73263D-01  -1.66928D-01   3.14713D+00   0.00000D+00   0.00000D+00   0.00000D+00
 274     2.06768D-01   1.33186D-01   3.14713D+00   0.00000D+00   0.00000D+00   0.00000D+00
 275    -1.58320D-01  -1.83331D-01   2.96814D+00   0.00000D+00   0.00000D+00   0.00000D+00
 276     1.95171D-01   1.43244D-01   2.96814D+00   0.00000D+00   0.00000D+00   0.00000D+00
 277    -1.43501D-01  -1.97928D-01   2.77741D+00   0.00000D+00   0.00000D+00   0.00000D+00
 278     1.80663D-01   1.47585D-01   2.77741D+00   0.00000D+00   0.00000D+00   0.00000D+00
 279    -1.17861D-01  -2.17800D-01   2.41396D+00   0.00000D+00   0.00000D+00   0.00000D+00
 280     1.53560D-01   1.32408D-01   2.41396D+00   0.00000D+00   0.00000D+00   0.00000D+00
 281    -9.37399D-02  -2.29865D-01   2.02950D+00   0.00000D+00   0.00000D+00   0.00000D+00
```

```
  283   -6.15346D-02  -2.31261D-01   1.44103D+00   0.00000D+00   0.00000D+00   0.00000D+00
  284    8.54708D-02   1.51070D-01   1.44103D+00   0.00000D+00   0.00000D+00   0.00000D+00
  285   -3.49495D-02  -2.00431D-01   8.79866D-01   0.00000D+00   0.00000D+00   0.00000D+00
  286    4.96379D-02   1.34791D-01   8.79866D-01   0.00000D+00   0.00000D+00   0.00000D+00
  287   -1.37838D-02  -1.36783D-01   2.75035D-01   0.00000D+00   0.00000D+00   0.00000D+00
  288    1.60045D-02   9.46955D-02   2.75035D-01   0.00000D+00   0.00000D+00   0.00000D+00
  291   -3.31347D-01   0.00000D+00   3.91436D+00   0.00000D+00   0.00000D+00   0.00000D+00
  292    2.85502D-01   0.00000D+00   3.91436D+00   0.00000D+00   0.00000D+00   0.00000D+00
  293   -3.27916D-01   1.20059D-02   3.91264D+00   0.00000D+00   0.00000D+00   0.00000D+00
  294    2.86965D-01   1.91503D-02   3.91264D+00   0.00000D+00   0.00000D+00   0.00000D+00
  295   -3.19020D-01   1.02506D-02   3.89004D+00   0.00000D+00   0.00000D+00   0.00000D+00
  296    2.82782D-01   3.98782D-02   3.89004D+00   0.00000D+00   0.00000D+00   0.00000D+00
  297   -3.01801D-01  -8.63347D-03   3.82476D+00   0.00000D+00   0.00000D+00   0.00000D+00
  298    2.77533D-01   5.80587D-02   3.82476D+00   0.00000D+00   0.00000D+00   0.00000D+00
  299   -2.78066D-01  -3.89162D-02   3.70747D+00   0.00000D+00   0.00000D+00   0.00000D+00
  300    2.69888D-01   7.33298D-02   3.70747D+00   0.00000D+00   0.00000D+00   0.00000D+00
  301   -2.52088D-01  -7.27104D-02   3.54072D+00   0.00000D+00   0.00000D+00   0.00000D+00
  302    2.59299D-01   8.65756D-02   3.54072D+00   0.00000D+00   0.00000D+00   0.00000D+00
  303   -2.27504D-01  -1.04244D-01   3.36171D+00   0.00000D+00   0.00000D+00   0.00000D+00
  304    2.40188D-01   9.82096D-02   3.36171D+00   0.00000D+00   0.00000D+00   0.00000D+00
  305   -2.00946D-01  -1.29901D-01   3.18002D+00   0.00000D+00   0.00000D+00   0.00000D+00
  306    2.32486D-01   1.07790D-01   3.18002D+00   0.00000D+00   0.00000D+00   0.00000D+00
  307   -1.91566D-01  -1.48084D-01   3.02859D+00   0.00000D+00   0.00000D+00   0.00000D+00
  308    2.23588D-01   1.14678D-01   3.02859D+00   0.00000D+00   0.00000D+00   0.00000D+00
  309   -1.81912D-01  -1.58650D-01   2.92779D+00   0.00000D+00   0.00000D+00   0.00000D+00
  310    2.12415D-01   1.18609D-01   2.92779D+00   0.00000D+00   0.00000D+00   0.00000D+00
  311   -1.67323D-01  -1.73531D-01   2.76500D+00   0.00000D+00   0.00000D+00   0.00000D+00
  312    1.96916D-01   1.24078D-01   2.76500D+00   0.00000D+00   0.00000D+00   0.00000D+00
  313   -1.51916D-01  -1.86731D-01   2.59120D+00   0.00000D+00   0.00000D+00   0.00000D+00
  314    1.84227D-01   1.28808D-01   2.59120D+00   0.00000D+00   0.00000D+00   0.00000D+00
  315   -1.25521D-01  -2.05329D-01   2.25801D+00   0.00000D+00   0.00000D+00   0.00000D+00
  316    1.56560D-01   1.35150D-01   2.25801D+00   0.00000D+00   0.00000D+00   0.00000D+00
  317   -1.00166D-01  -2.16576D-01   1.90373D+00   0.00000D+00   0.00000D+00   0.00000D+00
  318    1.27710D-01   1.38530D-01   1.90373D+00   0.00000D+00   0.00000D+00   0.00000D+00
  319   -6.59416D-02  -2.18484D-01   1.35715D+00   0.00000D+00   0.00000D+00   0.00000D+00
  320    3.61165D-02   1.38044D-01   1.35715D+00   0.00000D+00   0.00000D+00   0.00000D+00
  321   -3.74269D-02  -1.93583D-01   6.31976D-01   0.00000D+00   0.00000D+00   0.00000D+00
  322    4.91966D-02   1.24613D-01   6.31976D-01   0.00000D+00   0.00000D+00   0.00000D+00
  323   -1.14251D-02  -1.30203D-01   2.61149D-01   0.00000D+00   0.00000D+00   0.00000D+00
  324    1.47315D-02   3.91000D-02   2.61149D-01   0.00000D+00   0.00000D+00   0.00000D+00
  327   -3.35504D-01   0.00000D+00   3.29322D+00   0.00000D+00   0.00000D+00   0.00000D+00
  328    2.79961D-01   0.00000D+00   3.29322D+00   0.00000D+00   0.00000D+00   0.00000D+00
  329   -3.31678D-01   5.43814D-05   3.29052D+00   0.00000D+00   0.00000D+00   0.00000D+00
  330    2.78123D-01   7.10855D-05   3.29052D+00   0.00000D+00   0.00000D+00   0.00000D+00
  331   -3.22195D-01  -1.77396D-05   3.28590D+00   0.00000D+00   0.00000D+00   0.00000D+00
  332    2.78215D-01   1.84621D-02   3.28590D+00   0.00000D+00   0.00000D+00   0.00000D+00
  333   -3.05338D-01  -1.74147D-02   3.24119D+00   0.00000D+00   0.00000D+00   0.00000D+00
  334    2.73555D-01   3.13766D-02   3.24119D+00   0.00000D+00   0.00000D+00   0.00000D+00
  335   -2.83319D-01  -4.27824D-02   3.15308D+00   0.00000D+00   0.00000D+00   0.00000D+00
  336    2.66143D-01   4.38340D-02   3.15308D+00   0.00000D+00   0.00000D+00   0.00000D+00
  337   -2.59551D-01  -7.06628D-02   3.02703D+00   0.00000D+00   0.00000D+00   0.00000D+00
  338    2.59141D-01   5.02418D-02   3.02703D+00   0.00000D+00   0.00000D+00   0.00000D+00
  339   -2.36931D-01  -9.67169D-02   2.87835D+00   0.00000D+00   0.00000D+00   0.00000D+00
  340    2.47196D-01   6.77121D-02   2.87835D+00   0.00000D+00   0.00000D+00   0.00000D+00
  341   -2.17639D-01  -1.17922D-01   2.73014D+00   0.00000D+00   0.00000D+00   0.00000D+00
  342    2.34357D-01   7.72683D-02   2.73014D+00   0.00000D+00   0.00000D+00   0.00000D+00
  343   -2.02963D-01  -1.32813D-01   2.60554D+00   0.00000D+00   0.00000D+00   0.00000D+00
  344    2.25827D-01   8.40527D-02   2.60554D+00   0.00000D+00   0.00000D+00   0.00000D+00
  345   -1.93714D-01  -1.41284D-01   2.52221D+00   0.00000D+00   0.00000D+00   0.00000D+00
  346    2.15241D-01   8.76659D-02   2.52221D+00   0.00000D+00   0.00000D+00   0.00000D+00
  347   -1.79318D-01  -1.53414D-01   2.38760D+00   0.00000D+00   0.00000D+00   0.00000D+00
  348    2.02311D-01   9.33000D-02   2.38760D+00   0.00000D+00   0.00000D+00   0.00000D+00
  349   -1.64637D-01  -1.64167D-01   2.24338D+00   0.00000D+00   0.00000D+00   0.00000D+00
  350    1.88180D-01   9.81910D-02   2.24338D+00   0.00000D+00   0.00000D+00   0.00000D+00
  351   -1.38099D-01  -1.60206D-01   1.96525D+00   0.00000D+00   0.00000D+00   0.00000D+00
  352    1.60811D-01   1.05949D-01   1.96525D+00   0.00000D+00   0.00000D+00   0.00000D+00
  353   -1.11977D-01  -1.90117D-01   1.66635D+00   0.00000D+00   0.00000D+00   0.00000D+00
```

```
354    1.31784D-01   1.11157D-01   1.00033D+00   0.00000D+00   0.00000D+00   0.00000D+00
355   -7.55480D-02  -1.93018D-01   1.19877D+00   0.00000D+00   0.00000D+00   0.00000D+00
356    8.90336D-02   1.14661D-01   1.19877D+00   0.00000D+00   0.00000D+00   0.00000D+00
357   -4.41192D-02  -1.74051D-01   7.42169D-01   0.00000D+00   0.00000D+00   0.00000D+00
358    5.04581D-02   1.06463D-01   7.42169D-01   0.00000D+00   0.00000D+00   0.00000D+00
359   -1.43602D-02  -1.17478D-01   2.30723D-01   0.00000D+00   0.00000D+00   0.00000D+00
360    1.42670D-02   7.85913D-02   2.30723D-01   0.00000D+00   0.00000D+00   0.00000D+00
363   -3.29142D-01   0.00000D+00   2.68086D+00   0.00000D+00   0.00000D+00   0.00000D+00
364    2.69063D-01   0.00000D+00   2.68086D+00   0.00000D+00   0.00000D+00   0.00000D+00
365   -3.25564D-01   2.55092D-03   2.68928D+00   0.00000D+00   0.00000D+00   0.00000D+00
366    2.67345D-01  -8.46457D-04   2.68928D+00   0.00000D+00   0.00000D+00   0.00000D+00
367   -3.16341D-01  -4.06876D-03   2.68957D+00   0.00000D+00   0.00000D+00   0.00000D+00
368    2.66530D-01   4.30368D-03   2.68957D+00   0.00000D+00   0.00000D+00   0.00000D+00
369   -3.00979D-01  -2.03589D-02   2.66273D+00   0.00000D+00   0.00000D+00   0.00000D+00
370    2.65119D-01   1.25719D-02   2.66273D+00   0.00000D+00   0.00000D+00   0.00000D+00
371   -2.81335D-01  -4.15327D-02   2.60000D+00   0.00000D+00   0.00000D+00   0.00000D+00
372    2.61008D-01   2.26260D-02   2.60000D+00   0.00000D+00   0.00000D+00   0.00000D+00
373   -2.60164D-01  -6.43653D-02   2.50476D+00   0.00000D+00   0.00000D+00   0.00000D+00
374    2.53269D-01   3.34374D-02   2.50476D+00   0.00000D+00   0.00000D+00   0.00000D+00
375   -2.39825D-01  -8.56482D-02   2.38898D+00   0.00000D+00   0.00000D+00   0.00000D+00
376    2.42588D-01   4.39031D-02   2.38898D+00   0.00000D+00   0.00000D+00   0.00000D+00
377   -2.22281D-01  -1.02888D-01   2.27162D+00   0.00000D+00   0.00000D+00   0.00000D+00
378    2.30952D-01   5.27144D-02   2.27162D+00   0.00000D+00   0.00000D+00   0.00000D+00
379   -2.06607D-01  -1.14772D-01   2.17218D+00   0.00000D+00   0.00000D+00   0.00000D+00
380    2.20613D-01   5.88401D-02   2.17218D+00   0.00000D+00   0.00000D+00   0.00000D+00
381   -2.00192D-01  -1.21256D-01   2.10558D+00   0.00000D+00   0.00000D+00   0.00000D+00
382    2.13416D-01   6.23216D-02   2.10558D+00   0.00000D+00   0.00000D+00   0.00000D+00
383   -1.86375D-01  -1.30734D-01   1.99793D+00   0.00000D+00   0.00000D+00   0.00000D+00
384    2.01265D-01   6.69301D-02   1.99793D+00   0.00000D+00   0.00000D+00   0.00000D+00
385   -1.72398D-01  -1.39034D-01   1.88254D+00   0.00000D+00   0.00000D+00   0.00000D+00
386    1.87749D-01   7.12778D-02   1.88254D+00   0.00000D+00   0.00000D+00   0.00000D+00
387   -1.46447D-01  -1.52421D-01   1.65856D+00   0.00000D+00   0.00000D+00   0.00000D+00
388    1.61330D-01   7.94036D-02   1.65856D+00   0.00000D+00   0.00000D+00   0.00000D+00
389   -1.20177D-01  -1.60801D-01   1.41569D+00   0.00000D+00   0.00000D+00   0.00000D+00
390    1.32719D-01   8.33465D-02   1.41569D+00   0.00000D+00   0.00000D+00   0.00000D+00
391   -8.26051D-02  -1.64746D-01   1.02953D+00   0.00000D+00   0.00000D+00   0.00000D+00
392    8.98664D-02   9.17910D-02   1.02953D+00   0.00000D+00   0.00000D+00   0.00000D+00
393   -4.91321D-02  -1.50044D-01   6.45442D-01   0.00000D+00   0.00000D+00   0.00000D+00
394    5.04640D-02   8.79073D-02   6.45442D-01   0.00000D+00   0.00000D+00   0.00000D+00
395   -1.65359D-02  -1.03363D-01   2.10055D-01   0.00000D+00   0.00000D+00   0.00000D+00
396    1.34046D-02   6.78225D-02   2.10055D-01   0.00000D+00   0.00000D+00   0.00000D+00
399   -3.02610D-01   0.00000D+00   1.80958D+00   0.00000D+00   0.00000D+00   0.00000D+00
400    2.46340D-01   0.00000D+00   1.80958D+00   0.00000D+00   0.00000D+00   0.00000D+00
401   -3.00342D-01   1.69192D-03   1.82291D+00   0.00000D+00   0.00000D+00   0.00000D+00
402    2.45211D-01  -7.32249D-03   1.82291D+00   0.00000D+00   0.00000D+00   0.00000D+00
403   -2.93746D-01  -5.23336D-03   1.83572D+00   0.00000D+00   0.00000D+00   0.00000D+00
404    2.45913D-01  -7.47712D-03   1.83572D+00   0.00000D+00   0.00000D+00   0.00000D+00
405   -2.82194D-01  -1.77475D-02   1.83020D+00   0.00000D+00   0.00000D+00   0.00000D+00
406    2.45922D-01  -3.71380D-03   1.83020D+00   0.00000D+00   0.00000D+00   0.00000D+00
407   -2.66991D-01  -3.34419D-02   1.79885D+00   0.00000D+00   0.00000D+00   0.00000D+00
408    2.43282D-01   2.31545D-03   1.79885D+00   0.00000D+00   0.00000D+00   0.00000D+00
409   -2.50066D-01  -4.99054D-02   1.74295D+00   0.00000D+00   0.00000D+00   0.00000D+00
410    2.37111D-01   1.04302D-02   1.74295D+00   0.00000D+00   0.00000D+00   0.00000D+00
411   -2.33250D-01  -6.51031D-02   1.67031D+00   0.00000D+00   0.00000D+00   0.00000D+00
412    2.28065D-01   1.85165D-02   1.67031D+00   0.00000D+00   0.00000D+00   0.00000D+00
413   -2.18319D-01  -7.72315D-02   1.59409D+00   0.00000D+00   0.00000D+00   0.00000D+00
414    2.17967D-01   2.54482D-02   1.59409D+00   0.00000D+00   0.00000D+00   0.00000D+00
415   -2.06653D-01  -8.52482D-02   1.52840D+00   0.00000D+00   0.00000D+00   0.00000D+00
416    2.08922D-01   3.01000D-02   1.52840D+00   0.00000D+00   0.00000D+00   0.00000D+00
417   -1.99224D-01  -8.92398D-02   1.48414D+00   0.00000D+00   0.00000D+00   0.00000D+00
418    2.02700D-01   3.22467D-02   1.48414D+00   0.00000D+00   0.00000D+00   0.00000D+00
419   -1.87386D-01  -9.32164D-02   1.41296D+00   0.00000D+00   0.00000D+00   0.00000D+00
420    1.92169D-01   3.57671D-02   1.41296D+00   0.00000D+00   0.00000D+00   0.00000D+00
421   -1.75065D-01  -1.00213D-01   1.33673D+00   0.00000D+00   0.00000D+00   0.00000D+00
422    1.80514D-01   3.87776D-02   1.33673D+00   0.00000D+00   0.00000D+00   0.00000D+00
423   -1.51777D-01  -1.09556D-01   1.18850D+00   0.00000D+00   0.00000D+00   0.00000D+00
424    1.57126D-01   4.53006D-02   1.18850D+00   0.00000D+00   0.00000D+00   0.00000D+00
425   -1.27575D-01  -1.13504D-01   1.02552D+00   0.00000D+00   0.00000D+00   0.00000D+00
```

ORIGINAL PAGE IS
OF POOR QUALITY

234

```
427   -9.12926D-02  -1.20247D-01   7.60304D-01   0.00000D+00   0.00000D+00   0.00000D+00
428    9.11464D-02   5.97279D-02   7.60304D-01   0.00000D+00   0.00000D+00   0.00000D+00
429   -5.69682D-02  -1.11552D-01   4.87638D-01   0.00000D+00   0.00000D+00   0.00000D+00
430    5.25530D-02   6.05214D-02   4.87638D-01   0.00000D+00   0.00000D+00   0.00000D+00
431   -2.11094D-02  -7.98773D-02   1.65271D-01   0.00000D+00   0.00000D+00   0.00000D+00
432    1.45652D-02   5.05385D-02   1.65271D-01   0.00000D+00   0.00000D+00   0.00000D+00
435   -2.47976D-01   0.00000D+00   1.04435D+00   0.00000D+00   0.00000D+00   0.00000D+00
436    2.03122D-01   0.00000D+00   1.04435D+00   0.00000D+00   0.00000D+00   0.00000D+00
437   -2.40689D-01   1.77424D-03   1.05962D+00   0.00000D+00   0.00000D+00   0.00000D+00
438    2.02737D-01  -9.16347D-03   1.05962D+00   0.00000D+00   0.00000D+00   0.00000D+00
439   -2.43973D-01  -3.74972D-03   1.07756D+00   0.00000D+00   0.00000D+00   0.00000D+00
440    2.05384D-01  -1.15121D-02   1.07756D+00   0.00000D+00   0.00000D+00   0.00000D+00
441   -2.37366D-01  -1.26434D-02   1.06404D+00   0.00000D+00   0.00000D+00   0.00000D+00
442    2.06758D-01  -1.04773D-02   1.06404D+00   0.00000D+00   0.00000D+00   0.00000D+00
443   -2.27653D-01  -2.30740D-02   1.07363D+00   0.00000D+00   0.00000D+00   0.00000D+00
444    2.05936D-01  -7.16796D-03   1.07363D+00   0.00000D+00   0.00000D+00   0.00000D+00
445   -2.15968D-01  -3.37146D-02   1.04717D+00   0.00000D+00   0.00000D+00   0.00000D+00
446    2.01877D-01  -2.38207D-03   1.04717D+00   0.00000D+00   0.00000D+00   0.00000D+00
447   -2.03727D-01  -4.34640D-02   1.00846D+00   0.00000D+00   0.00000D+00   0.00000D+00
448    1.95180D-01   3.01522D-03   1.00846D+00   0.00000D+00   0.00000D+00   0.00000D+00
449   -1.92505D-01  -5.11384D-02   9.65698D-01   0.00000D+00   0.00000D+00   0.00000D+00
450    1.87437D-01   7.77424D-03   9.65698D-01   0.00000D+00   0.00000D+00   0.00000D+00
451   -1.83613D-01  -5.59158D-02   9.27976D-01   0.00000D+00   0.00000D+00   0.00000D+00
452    1.80452D-01   1.08160D-02   9.27976D-01   0.00000D+00   0.00000D+00   0.00000D+00
453   -1.77950D-01  -5.79119D-02   9.02405D-01   0.00000D+00   0.00000D+00   0.00000D+00
454    1.75677D-01   1.19305D-02   9.02405D-01   0.00000D+00   0.00000D+00   0.00000D+00
455   -1.68645D-01  -6.09603D-02   8.61736D-01   0.00000D+00   0.00000D+00   0.00000D+00
456    1.67352D-01   1.39016D-02   8.61736D-01   0.00000D+00   0.00000D+00   0.00000D+00
457   -1.58865D-01  -6.31728D-02   8.18546D-01   0.00000D+00   0.00000D+00   0.00000D+00
458    1.58096D-01   1.53685D-02   8.18546D-01   0.00000D+00   0.00000D+00   0.00000D+00
459   -1.40034D-01  -6.85536D-02   7.35042D-01   0.00000D+00   0.00000D+00   0.00000D+00
460    1.39299D-01   2.02035D-02   7.35042D-01   0.00000D+00   0.00000D+00   0.00000D+00
461   -1.19968D-01  -7.18475D-02   6.42264D-01   0.00000D+00   0.00000D+00   0.00000D+00
462    1.18154D-01   2.41545D-02   6.42264D-01   0.00000D+00   0.00000D+00   0.00000D+00
463   -8.80949D-02  -7.60354D-02   4.87169D-01   0.00000D+00   0.00000D+00   0.00000D+00
464    8.42035D-02   3.17604D-02   4.87169D-01   0.00000D+00   0.00000D+00   0.00000D+00
465   -5.73676D-02  -7.19411D-02   3.21553D-01   0.00000D+00   0.00000D+00   0.00000D+00
466    4.99303D-02   3.40654D-02   3.21553D-01   0.00000D+00   0.00000D+00   0.00000D+00
467   -2.24274D-02  -5.39650D-02   1.14605D-01   0.00000D+00   0.00000D+00   0.00000D+00
468    1.43413D-02   3.21775D-02   1.14605D-01   0.00000D+00   0.00000D+00   0.00000D+00
471   -1.47824D-01   0.00000D+00   2.94086D-01   0.00000D+00   0.00000D+00   0.00000D+00
472    1.24761D-01   0.00000D+00   2.94086D-01   0.00000D+00   0.00000D+00   0.00000D+00
473   -1.49759D-01   1.50338D-03   3.05083D-01   0.00000D+00   0.00000D+00   0.00000D+00
474    1.26683D-01  -6.66948D-03   3.05083D-01   0.00000D+00   0.00000D+00   0.00000D+00
475   -1.51234D-01  -1.64444D-03   3.17727D-01   0.00000D+00   0.00000D+00   0.00000D+00
476    1.30358D-01  -8.74099D-03   3.17727D-01   0.00000D+00   0.00000D+00   0.00000D+00
477   -1.50392D-01  -5.94717D-03   3.25733D-01   0.00000D+00   0.00000D+00   0.00000D+00
478    1.33543D-01  -9.14336D-03   3.25733D-01   0.00000D+00   0.00000D+00   0.00000D+00
479   -1.47205D-01  -1.04322D-02   3.27579D-01   0.00000D+00   0.00000D+00   0.00000D+00
480    1.34487D-01  -8.43336D-03   3.27579D-01   0.00000D+00   0.00000D+00   0.00000D+00
481   -1.42095D-01  -1.46692D-02   3.23245D-01   0.00000D+00   0.00000D+00   0.00000D+00
482    1.32913D-01  -6.33385D-03   3.23245D-01   0.00000D+00   0.00000D+00   0.00000D+00
483   -1.35817D-01  -1.85682D-02   3.13894D-01   0.00000D+00   0.00000D+00   0.00000D+00
484    1.29203D-01  -4.65032D-03   3.13894D-01   0.00000D+00   0.00000D+00   0.00000D+00
485   -1.29490D-01  -2.15062D-02   3.01879D-01   0.00000D+00   0.00000D+00   0.00000D+00
486    1.24494D-01  -2.37275D-03   3.01879D-01   0.00000D+00   0.00000D+00   0.00000D+00
487   -1.24267D-01  -2.32422D-02   2.90407D-01   0.00000D+00   0.00000D+00   0.00000D+00
488    1.20149D-01  -1.33744D-03   2.90407D-01   0.00000D+00   0.00000D+00   0.00000D+00
489   -1.20984D-01  -2.35870D-02   2.82330D-01   0.00000D+00   0.00000D+00   0.00000D+00
490    1.17269D-01  -1.14119D-03   2.82330D-01   0.00000D+00   0.00000D+00   0.00000D+00
491   -1.15304D-01  -2.41279D-02   2.70254D-01   0.00000D+00   0.00000D+00   0.00000D+00
492    1.12237D-01  -7.01046D-04   2.70254D-01   0.00000D+00   0.00000D+00   0.00000D+00
493   -1.09934D-01  -2.41321D-02   2.57779D-01   0.00000D+00   0.00000D+00   0.00000D+00
494    1.06904D-01  -6.36767D-04   2.57779D-01   0.00000D+00   0.00000D+00   0.00000D+00
495   -9.90579D-02  -2.55512D-02   2.35248D-01   0.00000D+00   0.00000D+00   0.00000D+00
496    9.60341D-02   1.18043D-03   2.35248D-01   0.00000D+00   0.00000D+00   0.00000D+00
497   -8.73709D-02  -2.61735D-02   2.09723D-01   0.00000D+00   0.00000D+00   0.00000D+00
```

```
 498    8.38234D-02    2.66332D-03    2.09725D-01    0.00000D+00    0.00000D+00    0.00000D+00
 499   -6.76959D-02   -2.83252D-02    1.65655D-01    0.00000D+00    0.00000D+00    0.00000D+00
 500    6.30185D-02    6.87009D-03    1.65655D-01    0.00000D+00    0.00000D+00    0.00000D+00
 501   -4.64555D-02   -2.74023D-02    1.14962D-01    0.00000D+00    0.00000D+00    0.00000D+00
 502    4.01176D-02    9.25629D-03    1.14962D-01    0.00000D+00    0.00000D+00    0.00000D+00
 503   -1.99707D-02   -2.23302D-02    4.42017D-02    0.00000D+00    0.00000D+00    0.00000D+00
 504    1.34055D-02    1.09639D-02    4.42017D-02    0.00000D+00    0.00000D+00    0.00000D+00
```

ORIGINAL PAGE IS
OF POOR QUALITY

ORIGINAL PAGE IS
OF POOR QUALITY

```
S H E L L   E L E M E N T   S T R E S S E S
 ELEMENT    LOAD    FXX1        FXX2        FYY1        FYY2        FXY1        FXY2        FYZ1        FYZ2        FXZ

     1        1   -12.03298    17.17466    -4.44124     7.23232     3.73263    -2.48547     2.70695     2.68015    -0.75204

     2        1    -9.07724    16.22718    -4.11314     2.86498     0.49980    -2.55391    -1.78430    -1.76664     0.54948

     3        1    -9.06972    17.91023    -4.06807     3.49515     3.89491    -3.67830     1.44627     1.43393    -0.06483

     4        1    -6.19170    15.66072    -3.08474     4.53906     0.49814    -2.35535    -2.32228    -2.29928     0.79899

     5        1    -4.52500    16.68290     0.47093     7.94633     3.10291    -4.07498     0.38522     0.36141    -0.28641

     6        1    -0.83777    12.00782    -1.74690     2.03688     0.48766    -2.06386    -3.55171    -3.51655     1.26580

     7        1     2.91039    11.57456    13.74697     0.59267     2.39211    -3.92327     0.33096     0.33362     0.32019

     8        1     5.25941     6.59951     7.96915    -5.53032     0.52009    -1.73775    -5.73232    -5.67557     1.65098

     9        1    10.16897     5.83604    24.40100    -8.07523     1.61207    -3.46736     2.31479     2.29187     0.58640

    10        1    11.86167    -0.97882    20.85318   -16.19596     0.23613    -1.24975    -9.44147    -9.34799     1.90282

    11        1    19.68607    -4.75240    47.00116   -28.77457     0.53614    -2.38481     5.97202     5.91289     1.36116

    12        1    19.46778    -9.76702    43.78365   -35.91167     0.03102    -0.72245   -15.50962   -15.35606     1.97366

    13        1    25.54356   -11.72342    63.97056   -42.43300    -0.46744    -1.18744    12.77055    12.65005     1.99829

    14        1    22.74167   -15.42376    60.40619   -49.53572    -0.69537     3.18830   -24.07380   -23.83545     1.19131

    15        1    35.21545   -22.84829    93.31814   -74.28416    -2.07777     0.33511    22.70601    22.48179     1.96675

    16        1    27.11974   -22.65178    90.39915   -75.50592     0.00000     0.00000   -33.99376   -33.65721     0.00000

    17        1   -17.08865    24.90167    -9.19097    12.18225     7.19594    -8.42355     5.95773     5.89875     0.43867

    18        1   -17.10296    26.20877    -9.23867    16.53924     6.87392   -10.18820     5.23200     5.18020    -1.31167

    19        1   -12.95786    21.40738    -7.16063     6.08413     2.61264    -7.43316    -5.48050    -5.42623     1.43101

    20        1   -12.69835    24.25974    -6.29563    15.59200     5.80279   -10.43563     3.82230     3.76446    -0.16044

   [illegible]
```

237

```
 21    1  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 22    1   -6.47293   22.33320   -0.63430   13.99125    4.12717  -10.20185    2.61809    2.59217   -0.83183
 23    1   -6.25401   10.89583   -3.72687    4.36777    2.40054   -7.51829   -5.82703   -5.76934    2.14453
 24    1   -2.22721   17.40475    9.09846    0.20416    2.96227   -9.17710    2.37403    2.35053   -0.36555
 25    1   -1.18330   12.15976    6.00988   -2.70593    1.66231   -8.61080   -7.67842   -7.60240    2.03920
 26    1    3.70055   12.34515   22.29025   -2.03795    1.96693   -7.97014    3.70688    3.72958   -0.67141
 27    1    4.69064    5.22330   17.94824  -13.01473    1.03600   -4.92053  -10.82082  -10.71982    2.20196
 28    1   12.67574    2.36431   44.36524  -22.54489    0.71293   -5.62469    6.60277    6.53740   -0.07275
 29    1   12.91948   -4.02230   41.36622  -32.65948   -0.11214   -2.79651  -16.13835  -15.97856    1.57655
 30    1   18.64547   -5.36500   61.11932  -37.13781   -0.84438   -3.03673   12.24057   12.11938    0.55748
 31    1   18.09369  -11.25653   57.65754  -46.33059   -1.41514   -0.47509  -23.98382  -23.74636    0.34825
 32    1   29.63146  -19.29123   96.11610  -73.11292   -2.51288   -0.61115   21.50035   21.28748    0.87722
 33    1   27.59505  -22.76765   91.98330  -73.89216   -1.38240    0.16081  -33.78534  -33.43103   -0.77544
 34    1  -21.71706   34.34022  -15.21560   24.88487   10.25728  -17.47041    8.61677    8.53146    0.05828
 35    1  -21.42880   35.44687  -14.25293   27.90702    8.46866  -17.06412    8.13457    8.05403   -2.27006
 36    1  -18.93177   29.05091  -11.15636   12.02654    5.79302  -13.36255   -9.95570   -9.85712    0.98964
 37    1  -15.98143   33.07115  -11.32191   27.42935    7.62762  -17.57487    6.34613    6.26329   -1.40901
 38    1  -17.10038   27.08571  -12.28969   13.78061    5.44620  -13.63028   -8.13962   -8.05903    2.03566
 39    1  -15.47939   30.30291   -6.88636   24.70482    6.21990  -10.73293    5.23601    5.20476   -0.76176
 40    1  -14.67830   24.97932   -9.83152   12.95475    4.95223  -13.64456   -7.93572   -7.85715    2.03240
 41    1  -12.11847   27.62315   -3.63142   21.76752    4.68309  -15.89060    4.08131    4.04090   -1.65853
 42    1  -11.20836   20.92204   -5.32746    9.53569    3.69822  -12.31869   -7.53931   -7.49467    2.69521
 43    1   -6.66388   22.01749    9.55412   13.16718    3.72956  -14.13297    3.83256    3.81441   -1.36312
```

ORIGINAL PAGE IS
OF POOR QUALITY

44	1	-6.12689	15.67621	4.72276	1.95948	3.10300	-10.83676	-9.00815	-8.91696	2.41346
45	1	-1.16509	16.40316	21.26209	4.38266	2.69194	-12.18604	4.90826	4.85966	-2.13089
46	1	-0.07961	8.52926	16.19393	-8.14566	2.25011	-8.41824	-11.57034	-11.45576	2.74914
47	1	7.78124	6.13064	42.39676	-16.14126	1.80427	-9.05364	7.29055	7.21636	-1.25411
48	1	8.91166	-1.23834	39.20440	-27.61546	0.79656	-5.47503	-16.57035	-16.40629	1.88912
49	1	14.86935	-2.50375	59.13005	-32.03284	0.13407	-5.52635	12.34337	12.22116	-0.62919
50	1	15.92921	-9.67996	56.11637	-42.51927	-0.65572	-2.17166	-24.23059	-23.96098	0.76294
51	1	28.04033	-18.30117	96.30694	-71.25662	-1.78578	-2.24441	21.18365	20.97392	0.23642
52	1	28.19419	-22.75152	93.98065	-75.63841	-1.61619	-0.60134	-37.68629	-37.31316	-0.50457
53	1	-23.15125	41.74749	-15.46471	39.31361	11.35347	-20.94469	11.64015	11.52490	1.03642
54	1	-23.12128	43.11049	-18.36461	43.85695	8.60810	-24.99209	9.09395	9.00391	-5.03729
55	1	-23.38602	35.59260	-18.01881	22.92067	8.57599	-20.97608	-12.26608	-12.14523	2.05628
56	1	-21.98134	40.47747	-13.33834	39.20356	8.57552	-24.32494	8.08893	8.00884	-1.56438
57	1	-22.01572	33.18592	-17.69340	23.99663	7.16066	-19.28464	-10.29160	-10.18990	1.46866
58	1	-19.78173	37.25261	-10.24676	37.55228	7.34588	-23.21652	6.78046	6.71332	-1.77612
59	1	-20.55734	30.49236	-15.40508	22.90120	7.17582	-19.27483	-9.36672	-9.27398	2.23699
60	1	-17.64495	33.71179	-5.69545	33.63263	6.46753	-21.72426	6.07771	6.01753	-1.57720
61	1	-16.56372	27.81915	-11.20760	20.57914	6.37435	-18.35833	-9.25490	-9.16326	2.08375
62	1	-15.09071	30.45326	0.30689	29.35951	5.59396	-20.38438	4.97070	4.92149	-2.91688
63	1	-15.12224	23.30634	-5.98357	16.06553	5.60407	-16.39513	-6.60732	-6.52210	3.14187
64	1	-10.38059	24.48600	9.82258	19.99772	5.13746	-18.10986	4.82906	4.78125	-2.52167
65	1	-9.99981	17.75077	4.44257	7.83116	4.83201	-14.45899	-9.95023	-9.85171	2.84815
66	1	-5.14988	18.52952	20.60901	10.42699	4.55401	-15.60611	5.68007	5.62383	-3.32465

```
67    1   -3.65916   10.42786   15.37369   -2.49922    4.07050  -11.49541  -12.09662  -11.97903    3.51322
68    1    3.65421    8.13370   40.41827  -10.14639    3.65421  -12.00420    7.78787    7.71076   -2.32271
69    1    5.87475    0.44741   37.46655  -22.16135    2.46018   -8.11421  -16.97345  -16.80540    2.60528
70    1   11.74464   -1.04365   57.03285  -27.13221    1.68000   -7.85421   12.46761   12.34416   -1.71923
71    1   14.31788   -6.67206   54.75967  -38.04049    0.44939   -4.09843  -24.45671  -24.21457    1.77624
72    1   20.53007  -17.74577   93.40716  -68.28618   -0.47897   -3.75666   20.91166   20.70461   -0.20436
73    1   28.46053  -22.25056   94.86645  -74.16854   -1.36426   -1.44803  -38.68608  -38.30502    0.04911
74    1  -21.39445   44.32177  -15.80707   52.45051    9.24093  -34.18088   13.89684   13.75925    0.76110
75    1  -22.12126   45.78035  -16.22976   37.31245    7.34856  -31.64551    7.97149    7.89257   -8.00452
76    1  -20.63740   40.88681  -22.69367   35.84361    9.45843  -27.54483  -11.90073  -11.78290    3.54612
77    1  -23.92228   45.43466  -13.64328   51.66998    8.04492  -29.33348    7.08672    7.01656   -3.29417
78    1  -25.12342   36.15688  -23.48215   37.29889    8.27225  -23.60264   -9.21852   -9.12725    2.41888
79    1  -21.32583   39.32745  -10.82352   47.80746    8.05321  -27.40686    7.47130    7.39733   -1.40506
80    1  -23.77495   33.80137  -17.55722   33.55460    9.19416  -24.48596  -10.04765   -9.94816    1.63950
81    1  -20.90463   37.26457   -7.98938   45.09861    7.63863  -26.08914    6.47398    6.40988   -2.32708
82    1  -23.63476   31.33749  -15.20278   31.89704    8.54009  -22.82748   -9.27815   -9.18629    2.22269
83    1  -19.68501   34.11400   -4.03695   40.48542    7.50718  -24.51918    6.08298    6.02275   -2.24502
84    1  -21.15362   28.77510  -10.30030   28.43652    7.94409  -21.48957   -9.40015   -9.30706    2.06544
85    1  -17.33131   30.77839    1.30741   35.11417    7.26224  -23.00041    5.09213    5.04171   -3.78250
86    1  -17.85518   24.26683   -5.15111   22.85937    7.72776  -19.24337   -8.71778   -8.63146    3.52874
87    1  -13.33368   25.01737    9.92055   25.36119    7.23571  -20.62201    5.10662    5.05546   -3.33730
88    1  -12.82600   18.79705    4.76376   14.00872    7.11168  -17.15932  -10.14379  -10.04336    3.29103
```

```
 89   1   -8.29487  19.15732  19.88734   13.14293   6.04780  -17.94223    5.90949    5.85898  -4.50150
 90   1   -6.35306  11.53663  15.02230    3.14934   6.44604  -15.98123  -12.06565  -11.96619   4.35855
 91   1    0.64590   9.34007  38.28752   -3.17254   6.04134  -14.24765    7.91099    7.83266  -3.26208
 92   1    3.59934   1.70293  35.85675  -16.45688   4.72756  -10.44947  -16.93101  -16.70337   3.45702
 93   1    9.00874  -0.19737  54.55477  -22.79121   4.06537   -9.77547   12.37051   12.24803  -2.73260
 94   1   12.75902  -7.64095  53.12536  -33.28144   2.24281   -5.96344  -24.29836  -24.05780   2.97939
 95   1   24.07745 -16.99560  92.85346  -64.40360   1.20312   -5.04484   20.44100   20.23602  -0.00950
 96   1   28.26325 -21.33961  94.20085  -71.13202  -0.82194   -2.14532  -38.69134  -38.30825   0.07242
 97   1  -16.17346  41.22910  -5.38901   62.53889   3.35798  -37.02553   14.09416   13.95403   0.35857
 98   1  -16.05190  41.95809 -11.78379   64.96216   3.64135  -35.06494    4.77128    4.72404  -9.57251
 99   1  -26.01362  42.02830 -21.04720   47.94625   7.61269  -31.06933   -8.45014   -8.36647   4.63491
100   1  -22.95510  45.58671 -10.85213   59.80760   6.32304  -31.20482    4.68467    4.63829  -4.80433
101   1  -25.83550  36.82939 -24.06233   49.36152   9.22951  -26.39607   -6.34227   -6.27948   3.37197
102   1  -21.57633  38.96774 -10.46509   56.55604   8.50091  -29.57516    5.66722    5.60913  -2.85732
103   1  -25.71448  34.49556 -18.71955   43.89458  10.88304  -26.83281   -7.66567   -7.58997   2.57240
104   1  -22.69712  37.14612  -8.06168   52.72977   8.96795  -27.77859    6.45631    6.39236  -2.06830
105   1  -25.16300  33.15662 -15.78732   42.24191  10.11165  -25.70396   -9.11921   -9.02693   1.30152
106   1  -22.30357  35.29582  -6.24924   49.37257   9.17176  -26.71049    5.65060    5.59405  -2.89725
107   1  -24.22410  30.91822 -13.05183   39.15847  10.12695  -24.18068   -6.37050   -6.26765   2.10367
108   1  -21.19407  32.33057  -2.96173   44.53298   9.43940  -25.30350    5.43416    5.38036  -2.75119
109   1  -22.38410  28.32275  -8.70776   34.92517   9.91736  -22.95516   -8.69533   -8.60925   2.00479
110   1  -19.10553  29.37200   2.22079   38.42265   9.51331  -23.97620    4.58636    4.54097  -4.44600
111   1  -19.19100  24.04637  -3.69554   28.43016  10.12596  -20.82728   -8.06466   -7.98501   3.82765
```

ORIGINAL PAGE IS
OF POOR QUALITY

112	1	-15.19996	24.15331	9.60793	28.78665	9.69089	-21.84741	4.73457	4.66769	-3.99558
113	1	-14.36546	18.90122	5.25395	19.21539	9.62053	-18.85863	-9.60970	-9.51456	3.56080
114	1	-10.27349	18.39659	13.95067	13.19995	9.35209	-19.29665	5.57516	5.51996	-5.26254
115	1	-7. 4258	11.90072	14.79720	7.84719	8.96807	-15.78364	-11.48083	-11.36716	5.07821
116	1	-1.56770	9.09991	36.04680	-1.48884	8.51891	-15.76787	7.55051	7.47575	-4.10469
117	1	1.01612	2.52916	34.19535	-11.46762	7.11562	-12.29357	-16.32248	-16.16067	4.25983
118	1	6.92649	0.17393	51.69457	-19.31839	6.32354	-11.19677	11.90252	11.76467	-3.62129
119	1	11.34278	-6.64361	51.11091	-28.82812	4.18225	-7.57527	-23.61943	-23.36558	4.13675
120	1	22.75494	-16.08967	89.15143	-60.31500	2.96959	-6.07404	19.69876	19.50372	-1.00590
121	1	27.58743	-20.14805	91.95812	-67.16016	-0.09642	-2.67493	-37.54897	-37.47423	1.30263
122	1	-6.30239	33.17185	11.31917	69.52074	-4.65797	-35.37966	12.11231	11.99239	0.10553
123	1	-11.73484	32.43989	-0.12232	67.08089	-2.18745	-34.22666	0.78575	0.77797	-8.89369
124	1	-20.17359	38.29815	-10.67188	57.61719	3.00476	-30.95479	-3.15789	-3.12662	4.47237
125	1	-18.35940	39.94822	-4.82459	63.11744	3.09194	-29.95177	1.44699	1.43266	-5.65529
126	1	-23.18082	35.13335	-13.77480	57.52302	8.55728	-27.69150	-2.41975	-2.39579	3.79662
127	1	-19.32258	35.98584	-7.58061	60.36232	8.09395	-29.53333	3.29453	3.26191	-4.33786
128	1	-25.54546	33.95861	-16.49709	51.49951	11.49515	-27.10499	-3.99953	-3.95993	3.21712
129	1	-23.16793	35.83209	-8.37200	57.74446	9.85584	-27.84780	4.09300	4.05247	-3.70328
130	1	-25.99898	32.84818	-16.04935	50.49886	11.70920	-25.94215	-5.96343	-5.90438	2.15956
131	1	-23.47166	34.01641	-7.62503	54.39298	10.66815	-26.89461	4.90438	4.85582	-2.42619
132	1	-25.12309	31.38197	-15.01325	47.41263	11.61717	-25.48541	-7.36556	-7.29263	1.07732
133	1	-22.82575	32.38353	-5.35544	50.75115	11.20607	-26.11522	4.24836	4.20630	-3.26834
134	1	-24.09790	29.37646	-10.66174	43.76091	12.00999	-24.30483	-6.77550	-6.70842	2.01226

242

```
  135    1   -21.66192   30.07676   -2.60848   40.09522   11.60371  -25.12121    4.14221    4.10120   -3.11172
  136    1   -22.34037   27.04299   -3.99695   39.23207   12.01206  -23.32604   -7.20738   -7.19543    2.04400
  137    1   -19.48384   27.14079    2.30983   39.55008   11.76997  -24.04263    3.43485    3.40084   -4.94271
  138    1   -19.10154   22.92050   -2.28167   32.04596   12.44606  -21.55514   -6.70824   -6.64183    4.03384
  139    1   -15.77743   22.44069    8.99851   30.44662   12.04958  -22.32041    3.67745    3.64104   -4.52075
  140    1   -14.50552   16.07888    3.62450   22.83188   11.98017  -19.81201   -8.34519   -8.26256    3.94783
  141    1   -10.84137   17.13726   18.03832   19.69314   11.64888  -20.00371    4.58259    4.53722   -5.90570
  142    1    -8.20931   11.30552   14.61566   11.10662   11.32120  -16.99624  -10.22076  -10.11956    5.63145
  143    1    -2.39039    8.22703   33.99204    0.84756   10.70533  -16.70574    6.58263    6.51745   -4.79421
  144    1     0.92919    2.54904   32.56946   -7.63866    9.26355  -13.60131  -15.06076  -14.91758    4.86567
  145    1     6.01141   -0.24515   49.51020  -16.95264    8.22241  -12.10404   10.94690   10.83852   -4.35900
  146    1    10.40442   -6.07124   48.95639  -25.15191    5.94448   -8.80349  -22.39413  -22.17240    5.01401
  147    1    21.35713  -15.49877   65.20541  -50.57699    4.48593   -6.70308   18.71421   18.52892   -1.41949
  148    1    26.57378  -18.65349   63.37927  -62.84496    0.68430   -3.30328  -36.40016  -36.03976    1.68910
  149    1    -0.51654   22.67025   31.92231   73.71211  -11.29946  -29.34015    6.59807    6.51294    0.20101
  150    1    -5.69835   20.46699   14.04961   66.36792   -7.93209  -29.39113   -2.02922   -2.00913   -0.45881
  151    1   -10.38274   30.15191    3.99118   64.94754   -2.94937  -28.15210    1.68421    1.66753    3.20740
  152    1   -11.35027   29.69927    3.76609   63.43874   -0.87984  -27.00956   -1.44609   -1.43237   -5.58567
  153    1   -16.45698   30.72253   -0.34372   61.80652    5.15704  -26.70109    1.38060    1.36713    3.41793
  154    1   -15.21398   30.30830   -2.20238   60.62643    5.73812  -27.48357    0.19862    0.19665   -5.20434
  155    1   -21.57167   31.16334  -10.33145   55.98384    9.83471  -25.60461   -0.01519   -0.01504    3.23693
  156    1   -20.26550   32.06255   -5.97756   58.98053    9.07551  -26.43732    1.05271    1.04229   -4.98260
  [illegible]
  [illegible]    1   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]

  158    1   -22.39644   31.33190    -7.23739   56.59341   11.32247   -26.07327     2.16103     2.13963    -3.89089

  159    1   -24.39633   30.20566   -12.67292   52.42049   12.96274   -24.97444    -3.63753    -3.60151     1.88318

  160    1   -22.91106   30.66978    -7.05534   53.96756   12.48026   -25.64429     3.04625     3.01609    -2.73574

  161    1   -24.32212   29.21111   -10.92164   49.83092   13.12670   -24.78645    -5.30777    -5.25522     0.88761

  162    1   -22.18089   29.32669    -4.78353   50.23617   12.92708   -25.23375     2.47513     2.45063    -3.56175

  163    1   -22.93607   27.35322    -8.77568   45.88845   13.70956   -23.98725    -4.77661    -4.72951     1.92615

  164    1   -21.07307   27.40322    -2.58569   40.05513   13.46402   -24.63838     2.44461     2.42041    -3.39010

  165    1   -21.19452   25.17006    -5.71451   41.40316   13.83427   -23.26331    -5.35328    -5.30028     2.04891

  166    1   -18.66218   24.33461     2.65995   39.26499   13.66725   -23.87166     1.78226     1.76461    -5.26686

  167    1   -17.83705   20.95986    -1.02826   33.71624   14.39548   -21.89777    -4.86317    -4.81502     4.16388

  168    1   -15.01193   20.08093     8.45748   30.76645   14.01015   -22.52296     2.09641     2.07565    -4.94500

  169    1   -13.30436   16.21973     5.94847   24.82589   13.94956   -20.37548    -6.54634    -6.48152     4.15316

  170    1    -9.86455   14.70582    17.41452   19.97953   13.50300   -20.40222     3.04406     3.01392    -6.50037

  171    1    -6.88772    9.45471    14.64256   12.85190   13.20473   -17.78626    -8.46699    -8.38316     5.97765

  172    1    -1.52190    6.17531    32.52865    1.92056   12.38850   -17.24490     5.10882     5.05824    -5.36541

  173    1     1.80166    1.25082    31.29148   -3.16631   10.92547   -14.42502   -13.32372   -13.19180     5.21241

  174    1     6.77628   -1.92823    47.87353  -13.76315    9.57325   -12.56536     9.58763     9.49270    -4.93693

  175    1    10.66342   -6.49682    47.11547  -22.58088    7.25437    -9.54649   -20.78194   -20.57617     5.45621

  176    1    21.20718  -13.90802    82.19467  -53.95756    3.46649    -7.01448    17.58845    17.41430    -1.81994

  177    1    23.43502  -17.33575    84.85008  -53.85256    1.34842    -3.29287   -34.67206   -34.32876     2.33711

  178    1     4.09173   12.33389    53.02496   75.76094  -13.36273   -20.93174     4.81222     4.76457     0.43177

  179    1    -2.54757   10.07440    30.89394   66.56263  -10.72853   -21.81210    -2.63580    -2.60971    -3.64532
```

```
180     1     -1.02792   20.03269   23.98556   70.34509   -6.10361  -24.18881    4.09335    4.05282    1.75410
181     1     -3.15794   18.37608   15.21885   62.82307   -4.81742  -23.64136   -2.95174   -2.92251   -4.67751
182     1     -7.25574   24.44706   10.62374   64.03852   -0.35748  -24.51562    4.10786    4.06719    2.51199
183     1     -8.90957   23.27410    5.11097   60.12865    1.73833  -24.68998   -2.43573   -2.41162   -5.32617
184     1    -13.85076   26.30304   -0.58016   58.85938    6.00305  -23.69038    3.23792    3.20586    2.80552
185     1    -14.03953   26.17017   -1.20939   58.41648    6.50087  -24.54033   -1.85462   -1.83626   -5.50597
186     1    -18.70920   27.12843   -6.75451   56.18553   10.11038  -23.33204    1.81159    1.79365    2.73296
187     1    -15.10725   27.27914   -4.74801   56.60789    9.90024  -24.48824   -0.96451   -0.95496   -5.03222
188     1    -21.49936   27.56080   -9.59847   54.41144   12.52004  -23.60033    0.26272    0.26012    2.23530
189     1    -20.51039   27.64006   -8.30190   54.67563   12.11558  -24.54217    0.07741    0.07664   -4.20616
190     1    -22.54510   27.51739  -10.15110   52.54835   13.75077  -23.93723   -1.38069   -1.36702    1.51785
191     1    -21.45466   27.49650   -8.51830   52.47672   13.46357  -24.53296    1.18042    1.16874   -3.06801
192     1    -22.29337   27.01785   -9.28593   50.48006   14.19238  -24.10028   -2.99320   -2.96356    0.79116
193     1    -20.83427   26.58339   -4.42162   49.03313   14.07608  -24.54776    0.43553    0.43122   -3.70931
194     1    -21.21533   25.22573   -7.16701   46.33946   14.91890  -23.65179   -2.50933   -2.48446    1.85129
195     1    -19.79531   24.35790   -2.45264   43.11335   14.79159  -24.28890    0.52935    0.52410   -3.60743
196     1    -19.26733   22.93176   -4.83980   42.12376   15.23539  -23.23432   -3.12932   -3.09833    2.13348
197     1    -17.04712   21.82892    2.70152   38.44765   15.06243  -23.79764   -0.24766   -0.24523   -3.45065
198     1    -15.82339   18.41213    3.17060   34.07499   15.79212  -22.08330   -2.71899   -2.69207    4.22502
199     1    -13.18283   17.24755    3.30381   30.19306   15.37839  -22.81294    0.16943    0.16775   -5.29351
200     1    -10.82413   13.44970    8.44419   25.55982   15.43407  -20.80791   -4.41459   -4.37086    4.29887
201     1     -7.58432   11.82761   17.24355   19.48666   14.80848  -20.67638    1.13172    1.12052   -6.87973
202     1     -4.16154    6.45227   13.01168   13.41245   14.50102  -16.24784   -6.41867   -6.35511    6.13463
```

203	1	0.92147	2.99434	31.95504	1.88606	13.44936	-17.47033	3.33879	3.30573	-5.83498
204	1	4.20316	-1.40355	30.81302	-3.94682	11.99652	-14.84958	-11.33647	-11.22621	5.31087
205	1	9.20113	-4.91590	47.26125	-13.63464	10.31771	-12.27446	8.03675	7.95718	-5.36767
206	1	12.18782	-8.12753	43.92826	-21.15640	7.97855	-9.78112	-19.05231	-18.86367	5.46251
207	1	22.58939	-17.82932	63.60076	-52.83102	5.82773	-6.83667	16.40694	16.30390	-2.16990
208	1	24.48437	-10.72544	61.01335	-33.75147	1.74361	-3.32489	-33.07347	-32.74799	2.35177
209	1	1.88374	3.45288	56.63046	62.90666	0.85125	-0.42086	-0.13836	-0.13699	-0.32826
210	1	3.76275	6.25588	63.19404	70.53986	-5.54131	-7.78940	1.28985	1.27708	0.26601
211	1	-1.83473	4.16503	45.20242	63.57038	-4.49072	-8.87217	-0.80982	-0.86120	-1.38492
212	1	3.33055	13.17050	49.99206	73.08514	-8.61906	-17.11364	2.88998	2.84156	0.63786
213	1	-2.89072	9.38936	29.25451	61.14799	-5.61229	-16.70449	-1.45219	-1.43781	-3.16814
214	1	-3.82228	18.44564	28.21692	65.91103	-4.73959	-20.32867	3.45110	3.41693	1.35271
215	1	-4.43383	10.40162	16.16253	59.29765	-1.80162	-19.92363	-1.64041	-1.62417	-4.30827
216	1	-6.80338	21.67337	11.36501	60.48538	1.43274	-21.01275	2.69428	2.66562	2.13341
217	1	-8.14088	20.88956	6.90800	57.87269	3.12993	-21.30039	-1.15583	-1.14439	-3.19030
218	1	-12.88423	23.26248	3.55977	56.73425	6.88332	-21.05029	1.73390	1.71673	2.53421
219	1	-12.53842	23.20022	0.97902	56.52672	7.31069	-21.99191	-0.34354	-0.34014	-5.32833
220	1	-16.94288	24.37293	-5.43658	54.40412	10.62955	-21.42548	0.22034	0.22410	2.55433
221	1	-18.03326	24.21318	-2.47383	54.93159	10.42676	-22.50893	0.74315	0.73579	-4.91311
222	1	-19.33741	24.40948	-3.25864	52.74044	12.93535	-22.11421	-1.42366	-1.40956	2.17535
223	1	-18.08733	24.53227	-4.02561	52.94975	12.63998	-23.00232	1.94721	1.92793	-4.16512
224	1	-20.21279	24.37574	-9.00406	50.93254	14.26988	-22.76394	-3.09509	-3.06444	1.51074
[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

ORIGINAL PAGE IS OF POOR QUALITY

225	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
226	1	-20.24346	23.99363	-3.32864	49.07569	15.03508	-23.21496	-4.53344	-4.48856	0.59330
227	1	-18.51367	23.62003	-2.76264	47.83035	14.97040	-23.73681	2.53843	2.51329	-3.91370
228	1	-19.55825	22.77758	-6.06641	45.28975	15.93992	-23.18115	-4.37461	-4.33129	1.75294
229	1	-17.93606	22.49338	-1.26111	44.34242	15.90349	-23.83119	2.69583	2.66914	-3.79118
230	1	-18.40100	21.24410	-4.58650	41.50241	16.53907	-23.10722	-4.94747	-4.89848	1.97371
231	1	-16.10652	20.30840	3.06175	38.38342	16.42768	-23.71224	1.87757	1.85898	-5.85508
232	1	-15.34411	17.55876	-0.00733	33.91932	17.02806	-22.19091	-4.67761	-4.63130	4.36298
233	1	-12.94533	16.57952	7.98859	30.65519	16.80713	-22.81092	2.27160	2.24911	-5.53251
234	1	-11.20233	13.33947	3.73751	25.90732	16.82086	-21.17986	-6.18157	-6.12637	4.46926
235	1	-8.16440	11.74194	15.06392	20.58220	16.31713	-21.11676	2.95177	2.92255	-7.25335
236	1	-5.31633	6.95654	14.08414	14.19458	15.65700	-18.69961	-7.92228	-7.84384	6.54921
237	1	-0.26771	3.79918	29.91290	3.67007	14.73879	-17.95294	4.82190	4.77416	-6.01423
238	1	3.13962	-0.59104	29.15198	-2.62378	13.07665	-15.41663	-12.31628	-12.19434	5.75439
239	1	7.81319	-3.87621	44.73055	-13.58102	11.43961	-13.17161	8.90203	8.81369	-5.45423
240	1	11.36372	-7.41117	44.50671	-19.77879	8.56414	-10.14299	-19.30004	-19.10895	6.00355
241	1	21.10932	-10.39709	70.92539	-49.73186	6.36440	-6.93171	10.50828	10.39730	-1.85078
242	1	23.84520	-16.16067	79.46402	-53.66889	1.65849	-3.19957	-31.96261	-31.64015	2.54503
243	1	3.75304	4.83823	49.75058	54.13962	0.96728	-0.37458	0.25027	0.24779	-1.00953
244	1	6.00151	7.14146	54.43083	60.61891	-3.45221	-6.69121	1.21031	1.19832	-0.19916
245	1	1.73332	5.61934	40.20956	55.54511	-2.07032	-7.30974	-0.27447	-0.27176	-1.95264
246	1	5.24751	11.48650	43.69883	62.23389	-5.16563	-13.20048	2.67191	2.64545	0.22257
247	1	0.40436	9.41272	27.55306	55.32128	-2.43219	-13.00078	-1.07934	-1.06846	-3.26493

```
248    1    1.20945   14.94191   20.79204   59.07997   -1.93459  -16.10915    3.14327    3.11215    0.91365
249    1   -1.83259   13.59962   10.45169   54.60366    0.40334  -16.25643   -1.41032   -1.39635   -4.43159
250    1   -4.22077   17.33102   12.38947   55.75807    3.14204  -17.40459    2.67416    2.64700    1.64429
251    1   -5.48413   16.78533    3.17029   53.93910    4.55418  -18.08086   -1.04583   -1.03548   -5.12518
252    1   -9.55377   18.76276    2.61041   53.40528    7.62742  -18.23391    1.61352    1.59754    2.06695
253    1   -9.33843   18.04461    2.00755   53.01143    8.24595  -19.35593   -0.26245   -0.25985   -5.36780
254    1  -13.33432   19.72830   -3.09587   51.75240   11.22796  -19.22763    0.21704    0.21409    2.12393
255    1  -12.61842   19.70445   -0.64266   51.67225   11.12610  -20.38874    0.62181    0.61367   -4.98318
256    1  -16.03251   20.42358   -5.99777   50.29950   13.47514  -20.31935   -1.36108   -1.34766    1.79190
257    1  -14.86706   20.27924   -2.11494   49.61836   13.25661  -21.21229    2.07457    2.05403   -4.26090
258    1  -17.25146   20.75950   -5.95216   48.67202   14.95730  -21.29644   -2.96657   -2.93720    1.16318
259    1  -15.79953   20.42641   -2.11239   47.56172   14.83351  -21.86067    3.38632    3.35279   -3.24100
260    1  -17.44490   20.00517   -0.61905   46.93573   15.66656  -22.03186   -4.44631   -4.40226    0.40377
261    1  -15.86764   20.15236   -1.36152   45.42636   15.88512  -22.59177    2.78380    2.75632   -4.07016
262    1  -17.15427   19.81667   -5.32557   43.74867   16.96698  -22.37312   -4.28819   -4.24573    1.56055
263    1  -15.55760   19.34021   -0.00336   42.13313   17.07982  -23.11554    3.08446    3.05392   -4.01975
264    1  -16.11432   18.45997   -3.57767   40.29728   17.83923  -22.72586   -4.95497   -4.90592    1.90967
265    1  -14.08239   17.57126    3.19521   37.33491   17.61321  -23.39425    2.12701    2.10595   -6.09568
266    1  -13.59455   15.39900    3.32156   33.45150   18.39776  -22.13826   -4.69031   -4.64387    4.39968
267    1  -11.34073   14.34143    7.33336   29.92626   18.28836  -22.80266    2.63554    2.60945   -5.86734
268    1   -9.79643   11.50396    5.63274   25.86468   18.37450  -21.50354   -6.17605   -6.11490    4.62209
269    1   -7.06310    9.98809   14.94386   20.81186   17.67329  -21.42157    3.02923    2.99924   -7.65475
270    1   -3.92027    5.59743   13.36954   14.81051   17.01344  -19.11173   -7.73897   -7.66235    6.84138
```

271	1	0.30652	2.52872	28.12550	4.30145	16.06097	-18.29367	4.79067	4.74324	-6.38859
272	1	3.88379	-1.34756	27.70715	-1.33102	14.23686	-15.87397	-11.88579	-11.76811	6.04249
273	1	6.27501	-4.75821	42.34450	-12.05322	12.43109	-13.40017	8.43676	8.35322	-5.73547
274	1	11.61349	-7.73967	42.34380	-18.03543	9.15032	-10.26452	-18.40171	-18.27692	6.20552
275	1	20.66737	-10.45306	73.46275	-47.06212	6.70356	-6.62757	15.74393	15.58805	-1.87064
276	1	22.79559	-13.24540	73.98529	-50.81801	2.06991	-3.04243	-30.45376	-30.15224	2.57139
277	1	9.02352	3.87059	42.27674	41.40230	0.69250	-0.44794	0.96721	0.95764	-1.76452
278	1	10.07996	6.06281	46.81397	49.71417	-1.55476	-4.99861	0.56055	0.55500	-0.88545
279	1	6.33330	4.46637	34.39176	44.39270	-0.09172	-3.05794	0.61172	0.60566	-2.52291
280	1	7.96825	8.94390	37.22017	51.72480	-1.70989	-9.26241	1.38634	1.37262	-0.29487
281	1	4.35202	7.30534	25.09942	46.26296	0.52100	-8.92054	0.27488	0.27216	-3.42417
282	1	3.52368	11.31807	23.54907	51.00003	1.16813	-11.73751	1.29856	1.28572	0.44867
283	1	1.44766	10.20830	16.62362	47.29412	2.93800	-11.89687	0.59912	0.59319	-4.34177
284	1	-1.79770	13.10773	11.46961	49.51476	5.31136	-13.49369	0.32717	0.32394	1.21457
285	1	-2.27231	12.59217	9.86758	47.79624	6.16495	-14.20245	1.55798	1.54256	-4.94195
286	1	-6.62331	14.33328	2.66934	46.30592	9.16168	-15.03116	-1.19947	-1.18759	1.72618
287	1	-5.93684	14.11791	3.17974	47.58800	9.30219	-16.09985	2.87657	2.84809	-5.10609
288	1	-10.12272	15.16271	-2.28827	47.23966	12.13790	-16.59811	-2.99694	-2.96726	1.90772
289	1	-8.72930	14.99158	2.35647	45.60254	11.92447	-17.66475	4.39469	4.35118	-4.79380
290	1	-12.18684	15.67914	-4.94120	46.02124	14.22732	-18.07348	-4.90030	-4.85164	1.68073
291	1	-10.30441	15.30590	1.33292	44.77710	13.99261	-18.29587	5.94125	5.88243	-4.09884
292	1	-13.09463	15.76132	-5.08603	44.40004	15.69419	-19.29935	-6.71574	-6.64925	1.09373

ORIGINAL PAGE IS
OF POOR QUALITY

293	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
294	1	-13.33143	15.30279	-5.05607	42.45500	16.70913	-20.22395	-8.21752	-8.13616	0.19916
295	1	-11.24967	15.10435	1.88314	40.92853	16.54040	-20.60669	7.19902	7.12774	-4.13723
296	1	-13.65747	15.47610	-4.49992	40.25967	17.93422	-20.98517	-8.43516	-8.37144	1.33641
297	1	-11.45047	14.60780	2.72340	38.29866	17.79244	-21.41286	7.75457	7.67779	-4.15503
298	1	-13.65141	15.14857	-3.05891	37.30414	19.01637	-21.73030	-9.27820	-9.16634	1.57569
299	1	-11.53236	14.55436	4.00459	35.32342	18.64738	-22.10262	7.13127	7.06066	-6.45986
300	1	-12.72994	13.91976	-0.46391	32.21485	19.78203	-21.73200	-9.30340	-9.21128	4.32007
301	1	-10.38419	13.03321	7.35527	29.25906	19.67722	-22.24933	7.73595	7.65935	-6.16411
302	1	-10.52124	11.70764	4.33942	25.43142	19.89682	-21.48000	-10.65294	-10.54747	4.60263
303	1	-8.12579	10.69536	12.32423	22.05649	19.48633	-21.34699	7.72462	7.64814	-8.20234
304	1	-6.31866	7.72485	10.99138	16.01618	18.54044	-19.52146	-11.74502	-11.62873	7.25636
305	1	-2.55362	5.22545	23.54084	7.68486	17.82461	-18.75649	8.80159	8.71445	-6.74255
306	1	0.70731	1.50381	24.66791	0.61079	15.50796	-16.40387	-14.86935	-14.72213	6.58670
307	1	4.15328	-1.60922	30.17449	-7.56598	13.96193	-13.92643	10.87772	10.77002	-6.02603
308	1	6.85136	-5.03165	39.29854	-15.32230	9.67861	-10.59556	-19.60336	-19.40926	6.94090
309	1	16.76152	-12.69715	65.73175	-40.87396	7.64344	-6.74979	15.84201	15.66515	-1.61522
310	1	21.09893	-14.34360	72.32976	-47.81202	2.19363	-2.79474	-28.90196	-28.67521	2.50816
311	1	17.40134	-2.39778	36.77862	28.30802	0.66081	-0.41674	1.74379	1.72053	-2.63082
312	1	17.96935	-0.39030	38.83104	33.99323	-0.21619	-3.50267	0.31002	0.30695	-1.69771
313	1	15.26495	-0.97039	29.81509	32.70624	1.20611	-3.23727	0.92065	0.91153	-3.16589
314	1	15.13039	1.34109	30.90331	37.45428	0.64432	-5.91074	0.99473	0.98486	-1.07110
315	1	12.70558	0.94903	22.82013	35.48075	2.28234	-5.80688	0.48543	0.48062	-3.79404

316	1	10.61454	3.24372	20.83545	38.90257	3.33346	-7.80331	0.96824	0.95666	-0.41950
317	1	9.27000	2.70301	16.35630	37.36686	4.49654	-8.27209	0.74083	0.74122	-4.37320
318	1	5.49991	4.73323	11.71462	39.58299	6.76990	-9.67959	0.17566	0.17412	0.20165
319	1	5.26417	4.44124	10.92882	38.60971	7.31169	-10.61639	1.02965	1.01351	-5.14701
320	1	0.82591	6.08815	4.79746	39.88506	10.06783	-11.63295	-1.16627	-1.15472	0.76260
321	1	1.47230	5.83630	6.95213	39.04554	10.07541	-12.73815	2.66236	2.65384	-5.36103
322	1	-2.79866	7.33022	0.32672	39.81459	12.76629	-13.59431	-2.80767	-2.77967	0.97634
323	1	-1.52690	6.94958	4.56591	38.54579	12.46594	-14.53800	4.33156	4.30848	-5.14303
324	1	-5.26446	8.35416	-2.06000	39.20942	14.80705	-15.38240	-4.60327	-4.55769	0.81643
325	1	-3.47116	7.07992	3.91762	36.96196	14.39026	-15.98013	5.87616	5.81798	-4.55434
326	1	-8.83283	8.94585	-2.60981	37.87470	16.32063	-16.86100	-6.39101	-6.32773	0.32464
327	1	-4.38332	7.90430	4.86787	34.40418	15.86654	-17.07620	7.25939	7.16751	-3.68977
328	1	-8.97591	8.93549	-1.83815	35.87335	17.26931	-17.90183	-7.98941	-7.91030	-0.41805
329	1	-5.16430	8.32902	4.43153	33.85179	17.02823	-18.15076	7.25784	7.16598	-4.32714
330	1	-7.78323	9.32958	-1.73086	34.58810	18.58058	-18.90443	-8.13679	-8.05622	0.72931
331	1	-5.73226	8.45652	5.10571	31.67791	18.43018	-19.30273	7.93085	7.88203	-4.35254
332	1	-7.95964	9.23757	-3.83436	32.23059	19.72636	-19.92866	-9.07261	-8.98296	1.09401
333	1	-8.33273	8.73807	4.78696	30.56558	19.62421	-20.37924	7.43726	7.33394	-5.69961
334	1	-8.20067	9.25209	3.31615	29.11107	20.86051	-20.59693	-9.00783	-8.91864	3.68913
335	1	-6.16916	8.23353	7.29044	23.71588	20.75785	-21.07103	8.21401	8.13266	-6.55441
336	1	-6.95748	8.00936	4.16748	23.57845	21.28804	-20.94744	-10.46115	-10.35757	4.46171
337	1	-5.12054	7.15170	10.29059	20.71959	20.87552	-20.77312	7.92248	7.84904	-8.01332
338	1	-4.33863	5.70154	9.08502	16.22629	20.18257	-19.61806	-11.30031	-11.18843	7.32713

339	1	-1.16349	3.39670	19.05231	8.54351	19.42304	-16.76935	6.69130	6.60327	-7.27017
340	1	1.32464	0.86045	21.14233	2.64854	17.26473	-16.90276	-14.09672	-13.95715	6.85869
341	1	4.11660	-1.36345	30.45466	-4.56445	15.47743	-14.17014	10.11672	10.01854	-6.54664
342	1	8.09551	-4.35884	34.24445	-11.65276	11.13416	-11.01510	-17.94761	-17.77011	7.33572
343	1	13.22549	-11.46997	58.01104	-35.35655	8.59531	-6.68345	14.07342	13.93408	-1.86981
344	1	19.57920	-12.64581	63.26401	-42.15269	2.75716	-2.71214	-20.51529	-20.25276	2.74621
345	1	27.23552	-10.85048	31.76434	14.37796	0.55812	-0.27525	2.41396	2.39008	-3.11997
346	1	26.47382	-9.34458	32.14144	19.08793	0.66091	-2.07661	0.00978	0.00968	-2.69758
347	1	24.45796	-8.88298	25.42196	19.62659	1.43559	-1.48331	1.47926	1.46462	-3.77163
348	1	22.47689	-6.62657	24.66853	23.77224	2.17022	-3.21844	0.18965	0.18778	-2.09777
349	1	21.16369	-6.88266	20.35120	22.91862	2.91476	-3.01353	1.42363	1.40953	-4.16959
350	1	17.64018	-4.85246	17.01471	26.52664	4.73678	-4.53919	-0.33412	-0.33081	-1.42876
351	1	17.29606	-5.21984	15.87431	25.30204	5.02505	-4.91818	2.23608	2.21394	-4.75192
352	1	12.61460	-3.30999	10.14050	28.39689	7.70034	-6.28901	-1.60791	-1.59199	-0.71278
353	1	13.16567	-3.71272	11.97741	27.05446	7.53265	-7.09433	3.69567	3.65908	-5.21035
354	1	6.16049	-1.86365	4.74003	29.73043	10.53352	-8.36237	-3.40259	[illegible]	-0.13037
355	1	9.43682	-2.37895	8.99443	23.01278	10.03273	-9.20162	5.46431	5.43001	-5.38857
356	1	4.72939	-0.57158	1.13885	30.40003	12.91670	-10.46022	-5.43901	-5.38515	0.19467
357	1	6.57568	-1.31892	7.29315	27.90892	12.25141	-11.18093	7.36491	7.29199	-5.16581
358	1	2.44264	0.40022	-3.67095	30.21690	14.76364	-12.37550	-7.54171	-7.46704	0.14196
359	1	4.82046	-0.72702	7.25513	26.45943	14.03454	-12.71170	9.12094	9.03063	-4.64763
360	1	1.23175	0.88954	-0.68618	28.96972	16.18141	-13.90890	-9.51018	-9.42196	-0.28147
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

361	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
362	1	0.90483	0.86986	0.86175	26.73677	17.13677	-15.01693	-11.13713	-11.02686	-0.96676
363	1	3.05267	0.00181	0.02105	23.64325	16.31347	-14.77218	11.02332	10.91418	-4.05194
364	1	-0.46330	1.85334	0.25995	26.41233	18.43019	-16.22732	-11.60699	-11.35146	0.05947
365	1	2.02573	0.59608	8.35680	22.22078	17.54155	-15.89077	12.03513	11.91597	-4.71605
366	1	-1.43922	2.58454	1.13398	24.70876	19.65930	-17.49669	-12.82407	-12.69710	0.34943
367	1	0.13100	2.12739	6.43472	23.15393	18.86040	-17.21219	12.18531	12.36486	-6.78999
368	1	-3.44451	4.40616	0.37575	24.03861	20.93887	-18.64694	-13.24578	-13.11463	3.09455
369	1	-1.30678	3.20127	7.49485	20.22231	20.26715	-18.41673	13.37257	13.24017	-6.73506
370	1	-3.96274	5.09239	3.24903	20.11676	21.66384	-19.57058	-14.80871	-14.66209	3.64610
371	1	-2.63998	4.55185	7.59157	18.31499	20.88439	-18.87220	13.19913	13.06845	-8.96098
372	1	-3.96690	5.58181	6.10195	15.75879	21.01003	-19.06986	-15.50119	-15.34771	6.94156
373	1	-1.72976	3.61278	13.55902	9.86201	20.17860	-17.99025	13.78804	13.65153	-7.77929
374	1	-0.32551	2.35073	18.34597	4.85574	18.42284	-16.99791	-17.30141	-17.13011	6.74879
375	1	1.60349	1.46875	21.04263	3.31579	16.73864	-14.23220	13.30296	13.17124	-7.33652
376	1	5.32693	-1.46142	27.92999	-7.45263	12.27809	-11.40964	-18.88087	-18.69393	7.62055
377	1	10.30831	-6.92717	44.53823	-23.67180	10.06316	-7.19356	13.93050	13.79256	-2.29113
378	1	17.22811	-10.90834	57.42703	-30.36113	3.17486	-2.54825	-23.79746	-23.56186	2.67431
379	1	45.16120	-28.93756	29.00898	-0.32260	0.26761	-0.09366	2.70657	2.67978	-4.03102
380	1	44.30191	-27.98283	28.70994	1.20428	0.57919	-0.74054	0.31033	0.30746	-4.00204
381	1	42.77335	-26.92518	23.69142	4.72976	0.75295	0.11199	0.97441	0.96476	-4.38273
382	1	39.83275	-25.22536	21.95673	6.73707	2.03535	-0.85839	0.65329	0.64682	-3.66946
383	1	39.28831	-24.94345	20.24393	7.67676	2.12432	-0.59400	0.77510	0.76743	-4.72691

ORIGINAL PAGE IS
OF POOR QUALITY

```
384   1   34.62435  -23.10674  16.40704  10.09327   4.36007   -1.72314    0.13209    0.15078  -3.25337
385   1   35.39043  -23.16531  17.29350   9.89938   4.09388   -1.96430    1.57022    1.55467  -3.35465
386   1   29.74677  -21.12400  11.65711  12.65711   7.01080   -3.25671   -1.05151   -1.02115  -2.60889
387   1   30.61513  -21.39312  14.34498  11.75336   6.42496   -3.80735    2.97001    2.94060  -3.89342
388   1   23.09013  -19.06885   7.78261  14.74663   9.60628   -5.25156   -2.62197   -2.39601  -2.13966
389   1   20.42355  -19.38259  12.22836  13.69982   6.75295   -5.77636    4.55138    4.66352  -6.17509
390   1   21.21274  -17.69033   5.33621  10.18451  11.87062   -7.34612   -4.43993   -4.30027  -1.76905
391   1   22.94376  -17.67663  10.81560  13.55693  10.79496   -7.55635    6.36433    6.30132  -6.09252
392   1   15.33662  -15.38303   3.69773  16.63609  13.67171   -9.20649   -6.26396   -6.20194  -1.74928
393   1   20.49336  -16.35162  10.59361  12.64140  12.37055   -8.93600    7.88501    7.86694  -5.67617
394   1   16.59377  -14.27832   4.06220  15.73565  14.97555  -10.66624   -8.03241   -7.95266  -2.03001
395   1   19.14754  -13.90214  12.37415  10.32357  13.38682   -9.64315    8.99225    8.90322  -3.62039
396   1   16.01326  -13.98647   6.06110  13.49028  15.72997  -11.39433   -9.30965   -9.41550  -2.3467.
397   1   17.76893  -14.00177  11.70666  10.77261  14.40009  -10.65283    9.61521    9.52001  -5.55158
398   1   14.03352  -12.37090   3.06983  13.90766  16.86665  -12.74752   -9.90841   -9.81031  -1.57908
399   1   16.13703  -13.00210  12.16904   9.60366  15.47604  -11.53833   10.50327   10.45666  -5.55379
400   1   12.35432  -11.09850   3.81254  12.06803  17.93133  -13.90583  -10.90621  -10.85763  -1.22374
401   1   15.37150  -11.40584   9.26913  11.64355  16.71361  -12.14013   10.99951   10.39061  -7.13803
402   1    8.62314   -7.31433   3.29373  14.60499  19.43885  -15.44505  -11.28823  -11.17046   1.53772
403   1   10.32231   -6.71332   9.23496  10.00336  18.26177  -14.59216   12.29108   12.16939  -7.39938
404   1    6.30221   -4.96140   4.75170  12.71942  20.46969  -16.78857  -12.80012  -12.73279   2.11778
405   1    7.23137   -3.36933   7.34391  11.29298  19.18196  -15.57703   12.26315   12.14174  -8.94552
406   1    3.13873   -1.31929   4.63392  12.64240  20.66650  -17.35739  -13.52603  -13.39211   5.64398
```

```
407    1    4.72743   -2.55104    9.97961    0.93457   19.33809  -15.84508   13.11179   12.98197   -7.99543
408    1    3.18043   -3.20573   11.48555    5.14802   18.92753  -16.39013  -13.17294  -13.02271    0.10770
409    1    3.33334   -1.13009   13.08034    1.90034   10.64867  -13.37947   12.14773   12.02747   -7.66316
410    1    4.90730   -1.07436   19.55700   -3.08373   13.51851  -11.92182  -10.02871  -15.37001    6.02775
411    1    3.30456   -3.05734   33.01493  -16.35966   10.93960   -7.42000   11.31001   11.39004   -2.59132
412    1   13.31014   -3.12128   44.30713  -27.07095    4.03300   -2.70884  -19.13545  -18.94002    3.42476
413    1   57.01989  -42.29953   24.97855  -10.20577   -0.47835    0.40838    1.77268    1.75513   -4.31807
414    1   56.03808  -41.53210   24.74143  -11.55642    0.21360    0.38499    1.13450    1.12327   -5.32460
415    1   55.20454  -40.33244   21.30398   -0.55735   -0.42225    1.44171   -0.39571   -0.39179   -4.95254
416    1   52.10237  -39.22049   18.95518   -0.41949    1.13809    1.11533    1.34934    1.33569   -5.30967
417    1   52.33597  -38.79442   19.73386   -4.97927    0.62740    1.31473   -0.34381   -0.34041   -5.35863
418    1   48.14300  -37.73777   15.34307   -3.04417    3.03014    0.89569    0.59350    0.58789   -5.33257
419    1   49.37743  -37.79535   13.45384   -3.83777    2.19875    0.52413    0.30503    0.35047   -6.01943
420    1   43.99827  -36.19810   12.44730   -1.45653    5.22215   -0.47576   -0.70425   -0.75008   -4.93317
421    1   43.30014  -35.30740   17.30087   -2.08753    4.08204   -0.74387    2.60124    2.63489   -6.36801
422    1   39.98237  -34.33020    9.98378    0.53459    7.42363   -2.15212   -2.40073   -2.45022   -4.45363
423    1   41.02043  -34.99971   13.31731   -1.61044    6.01815   -2.23543    4.08233    4.03397   -6.92350
424    1   36.43999  -32.30317    3.07342    2.18411    9.38309   -3.90822   -4.32079   -4.27801   -4.60309
425    1   38.31023  -33.30308   14.40435   -0.93758    7.74312   -3.83766    0.30025    0.31310   -6.94119
426    1   33.89632  -30.01600    7.19170    2.95434   10.93354   -5.37803   -0.12476   -0.00413   -3.91894
427    1   35.82015  -31.50446   14.29037   -1.27180    9.01756   -4.73983    8.03829    7.95573   -6.63808
428    1   32.33403  -29.46892    7.83828    2.30869   11.96404   -6.75954   -7.72744   -7.65093   -4.00050
[illegible]    1   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
429    1   34.33020  -31.00943  13.44379  -2.13333   9.00140  -3.29209   0.33903   0.?5230  -0.81?03
430    1   31.32700  -29.10300  10.33143   0.13421  12.46012  -7.41020  -8.90339  -8.37403  -4.41129
431    1   32.95734  -29.94194  11.51990  -2.30205  10.34506  -3.92034   9.60967   9.39373  -6.42256
432    1   29.30293  -27.28143   9.11030   1.01335  13.45197  -8.45546  -9.33720  -9.24482  -3.83440
433    1   31.03294  -28.43706  14.95166  -2.03076  10.89123  -6.42421  10.48009  10.38280  -6.37340
434    1   27.42333  -25.30703   9.76020   0.30574  14.20220  -9.35594 -10.21094 -10.10984  -3.35076
435    1   25.27150  -23.32324  12.37359  -3.00812  11.07250  -7.20562  11.41903  11.30597  -7.20562
436    1   22.43073  -20.30266   6.40606   3.03819  13.46779 -10.79978 -10.69703 -10.59172  -1.25839
437    1   23.91110  -21.74397  11.34252  -0.30943  12.74434  -8.29413  12.75543  12.62914  -7.10490
438    1   18.32374  -16.12214   0.69830   3.53105  16.47460 -12.10362 -12.10076 -12.04032  -0.50635
439    1   15.32442  -13.83830   5.30347   3.90966  13.75501  -9.40012  13.43830  13.35475  -8.32965
440    1   11.72323   -8.30150   4.37764   0.30830  17.10624 -13.38490 -13.19035 -13.05975   2.60295
441    1   12.27703  -10.23738   7.33970   1.03309  14.64911 -10.58437  14.61800  14.67129  -7.65509
442    1    7.75394   -3.91275   7.03912   3.32028  16.57140 -13.30992 -14.58310 -14.43680   3.65827
443    1    7.30306   -4.43943   3.79019   1.50001  13.03033  -9.96032  13.73939  13.65300  -7.54051
444    1    4.75031   -0.49380  11.73473  -0.09182  12.76223 -10.03461 -14.00541 -14.32021   6.72121
445    1    3.20124   -2.03370  13.43303  -3.39129   9.90325  -6.61737  11.37584  11.20321  -3.23300
446    1    3.99077   -3.10311  27.39309 -17.21036   4.30007  -2.72027 -13.03202 -13.34713   3.32960
447    1   31.75937  -33.13710  20.01173 -13.98082   0.00000   0.00000   0.00000   0.00000  -4.24382
448    1   33.18031  -70.33230  27.41969 -23.92590  -3.70500   1.74892   1.77200   1.75513  -5.80933
449    1   32.27037  -69.17712  25.33320 -19.24132  -0.20005   1.28054  -1.37206  -1.35031  -3.49903
450    1   33.31372  -71.74030  24.40324 -21.32060  -0.03451   2.04114   1.70774   1.69063  -7.41310
451    1   33.70309  -71.23700  20.70113 -19.01180   0.31573   1.67827  -1.33930  -1.34592  -0.89950
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
452    1   82.20695  -73.61343   23.31993  -20.53476    1.36504    2.53621    1.13930    1.12800   -8.23100
453    1   83.20279  -72.91027   20.50613  -20.20673    1.14180    1.75533   -0.60225   -0.59629   -8.02540
454    1   80.40477  -73.20393   22.42340  -19.85072    2.91028    1.89103    0.42489    0.42089   -8.59503
455    1   81.30342  -73.43272   20.09056  -20.40652    1.99722    1.62305    0.39414    0.39024   -8.81021
456    1   77.30630  -72.12585   21.27258  -18.67638    4.46939    0.80918   -0.43316   -0.42889   -8.61982
457    1   76.06536  -72.37405   23.22392  -20.17039    2.62034    1.31210    1.55644    1.52123   -9.26153
458    1   73.97628  -69.34493   19.97580  -17.25320    5.92839   -0.46762   -1.39624   -1.36440   -8.42436
459    1   75.21753  -70.33206   24.13030  -19.61013    3.36510    0.89260    2.70789    2.68106   -9.38259
460    1   70.51333  -67.14036   19.01373  -16.10550    7.10654   -1.69211   -2.42726   -2.40317   -8.13576
461    1   71.71736  -67.97832   23.32617  -18.69761    4.14340    0.49397    3.60087    3.65432   -9.19563
462    1   67.92161  -64.92349   19.68369  -15.96963    7.60491   -2.49642   -3.37113   -3.33775   -7.91176
463    1   68.32028  -65.30755   22.10137  -18.24317    4.40251    0.25679    4.23034    4.20820   -8.83025
464    1   62.70591  -63.85893   20.31216  -17.21231    7.93686   -2.74011   -4.07999   -4.03960   -7.87119
465    1   67.00679  -64.03633   21.51316  -17.81198    4.32871    0.21911    4.33409    4.31177   -8.40291
466    1   63.30415  -61.02193   19.51333  -16.15667    8.39023   -3.28216   -3.83126   -3.79353   -7.15346
467    1   63.57259  -61.28301   20.34449  -17.04735    4.63255    0.13460    4.54426    4.45925   -8.162
468    1   60.39661  -58.32522   19.35277  -16.07638    8.45276   -3.49833   -4.00373   -3.96469   -
469    1   60.83333  -58.37592   17.53633  -16.23337    4.63337    0.12220    4.53743    4.51232
470    1   54.42634  -51.62229   16.13944  -12.52410    9.60208   -4.35925   -3.78219   -3.7447
471    1   54.37633  -52.43443   17.83843  -14.50457    4.90563   -0.22064    5.18153    5.
472    1   46.21573  -43.25001   14.95330  -11.00400    9.51314   -5.13307   -4.41703   -
473    1   48.40034  -45.70137   13.30908  -12.68914    5.02531   -0.51136    5.33093
474    1   37.17908  -33.43725   13.65724   -6.32157   10.42403/  -6.59266   -5.08203
```

```
475     1   37.01030  -34.30957   12.11393   -9.49590    5.43843   -1.31906    0.81107
476     1   20.95537  -21.31572    9.11303   -4.12281   10.74998   -7.53179   -6.02592
477     1   23.74021  -21.87090    3.29745   -3.99338    5.20123   -1.77721    7.39105     ..
478     1   11.95210   -8.96984    6.52230   -0.83777    9.37247   -7.18604   -6.82081   -6.7
479     1   11.35654   -7.30087    3.33823   -1.97122    4.26740   -2.10891    0.43916    6.3754.
480     1    3.72093   -1.73830   12.40310   -3.80099    3.83436   -2.54839   -5.20713   -5.21496
```

ORIGINAL PAGE IS
OF POOR QUALITY

APPENDIX C

Analysis of Axisymmetric Laminated Cylinders Under Axisymmetric Load

The strain energy expression for axisymmetric deformations of a laminated cylindrical shell which has orthotropic layers with principal material axes which coincide with the longitudinal and circumferential cylinder directions is given by Eqs. (2.4) and (2.12) as

$$U = \pi R \sum_{i=1}^{N} \int_{0}^{L} h_i \{ \frac{1}{3} E_{11}^{i} [(1 + \frac{d_i + \frac{1}{4} h_i}{R})(\frac{du_i}{dx})^2 + (L + \frac{d_i + \frac{1}{2} h_i}{R}) .$$

$$\frac{du_i}{dx} \frac{du_{i+1}}{dx} + (1 + \frac{d_i + \frac{3}{4} h_i}{R})(\frac{du_{i+1}}{dx})^2] +$$

$$E_{12}^{i} \frac{w}{R} (\frac{du_i}{dx} + \frac{du_{i+1}}{dx}) + E_{22}^{i} \frac{w^2}{Rh_i} \ln (\frac{1 + d_{i+1}/R}{1 + d_i/R})$$

$$+ G_{44}^{i} (1 + \frac{d_i + \frac{1}{2} h_i}{R})(\frac{u_{i-1} - u_i}{h_i} + \frac{dw}{dx})^2 \} dx \qquad (C1)$$

where the material properties and thicknesses are assured to be constant within each layer.

The first variation of U can now be obtained with integration by parts as

$$\delta U = 2\pi \overset{\Gamma}{R}_1 \sum_{i=1}^{N} h_i \Big[(\{ E_{11}^{i} [\frac{1}{3} (1 + \frac{d_i + \frac{1}{4} h_i}{R}) \frac{du_i}{dx} +$$

$$\frac{1}{6}(1 + \frac{d_i + \frac{1}{2} h_i}{R}) \frac{du_{i+1}}{dx}] + \frac{1}{2} E_{12}^{i} \frac{w}{R} \} \delta u_i + \{ E_{11}^{i} [\frac{1}{6}(1 + \frac{d_i + \frac{1}{2} h_i}{R})$$

$$\frac{du_i}{dx} + \frac{1}{3} (1 + \frac{d_i + \frac{3}{4} h_i}{R}) \frac{du_{i+1}}{dx}] + \frac{1}{2} E_{12}^{i} \frac{w}{R} \} \delta u_{i+1} +$$

$$G^{i}_{44}\left(1+\frac{d_i+\frac{1}{2}h_i}{R}\right)\left(\frac{u_{i+1}-u_i}{h_i}+\frac{dw}{dx}\right)\delta w\,\Bigg|_{x=0}^{x=L} -$$

$$\int_0^L \{E^{i}_{11}\left[\frac{1}{3}\left(1+\frac{d_i+\frac{1}{4}h_i}{R}\right)\frac{d^2u_i}{dx^2}+\frac{1}{6}\left(1+\frac{d_i+\frac{1}{2}h_i}{R}\right)\frac{d^2u_{i+1}}{dx^2}\right] +$$

$$\frac{1}{2}\frac{E^{i}_{12}}{R}\frac{dw}{dx}+\frac{1}{h_i}G^{i}_{44}\left(1+\frac{d_i+\frac{1}{2}h_i}{R}\right)\left(\frac{u_{i+1}-u_i}{h_i}+\frac{dw}{dx}\right)\}\delta u_i +$$

$$\{E^{i}_{11}\left[\frac{1}{6}\left(1+\frac{d_i+\frac{1}{2}h_i}{R}\right)\frac{d^2u_i}{dx^2}+\frac{1}{3}\left(1+\frac{d_i+\frac{3}{4}h_i}{R}\right)\frac{d^2u_{i+1}}{dx^2}\right] +$$

$$\frac{1}{2}\frac{E^{i}_{12}}{R}\frac{dw}{dx}-\frac{1}{h_i}G^{i}_{44}\left(1+\frac{d_i+\frac{1}{2}h_i}{R}\right)\left(\frac{u_{i+1}-u_i}{h_i}+\frac{dw}{dx}\right)\}\delta u_{i+1} +$$

$$\{G^{i}_{44}\left(1+\frac{d_i+\frac{1}{2}h_i}{R}\right)\left[\frac{1}{h_i}\left(\frac{du_{i+1}}{dx}-\frac{du_i}{dx}\right)+\frac{d^2w}{dx^2}\right] -$$

$$[E^{i}_{22}\frac{w}{Rh_i}\ln\frac{1+d_{i+1}/R}{1+d_i/R}+\frac{1}{2}\frac{E^{i}_{12}}{R}\left(\frac{du_i}{dx}+\frac{du_{i+1}}{dx}\right)]\}\delta w)\,dx\Big] \qquad \text{(C2)}$$

The Euler equations for the cylinder are then

$$E^{1}_{11}h_1\left[\frac{1}{3}\left(1+\frac{h_1}{4R}\right)\frac{d^2u_1}{dx^2}+\frac{1}{6}\left(1+\frac{h_1}{2R}\right)\frac{d^2u_2}{dx^2}\right]+\frac{E^{1}_{12}h_1}{2R}\frac{dw}{dx} +$$

$$G^{1}_{44}\left(1+\frac{h_1}{2R}\right)\left(\frac{u_2-u_1}{h_1}+\frac{dw}{dx}\right) = 0 \qquad \text{(C3a)}$$

$$E^{N}_{11}h_N\left[\frac{1}{6}\left(1+\frac{d_N+\frac{1}{2}h_N}{R}\right)\frac{d^2u_N}{dx^2}+\frac{1}{3}\left(1+\frac{d_N+\frac{3}{4}h_N}{R}\right)\frac{d^2u_{N+1}}{dx^2}\right]$$

$$+\frac{1}{2}E^{N}_{12}\frac{h_N}{R}\frac{dw}{dx}-G^{N}_{44}\left(1+\frac{d_N+\frac{1}{2}h_N}{R}\right)\left(\frac{u_{N+1}-u_N}{h_N}+\frac{dw}{dx}\right) = 0 \qquad \text{(C3b)}$$

$$\frac{1}{6}E_{11}^{i-1} h_{i-1} \left(1+\frac{d_{i-1}+\frac{1}{2}h_{i-1}}{R}\right) \frac{d^2u_{i-1}}{dx^2} + \frac{1}{3}\left[E_{11}^{i-1}h_{i-1}\left(1+\frac{d_{i-1}+\frac{3}{4}h_{i-1}}{R}\right)\right.$$

$$\left. + E_{11}^{i} h_{i} \left(1+\frac{d_{i}+\frac{1}{4}h_{i}}{R}\right)\right] \frac{d^2u_{i}}{dx^2} + \frac{1}{6}E_{11}^{i+1} h_{i+1}$$

$$\left(1+\frac{d_{i}+\frac{1}{2}h_{i}}{R}\right) \frac{d^2u_{i+1}}{dx^2} + \frac{1}{2R}\left(E_{12}^{i-1} h_{i-1} + E_{12}^{i} h_{i}\right)\frac{dw}{dx}$$

$$- G_{44}^{i-1}\left(1+\frac{d_{i-1}+\frac{1}{2}h_{i-1}}{R}\right)\left(\frac{u_i-u_{i-1}}{h_{i-1}}+\frac{dw}{dx}\right)$$

$$+ G_{44}^{i}\left(1+\frac{d_{i}+\frac{1}{2}h_{i}}{R}\right)\left(\frac{u_{i+1}-u_{i}}{h_{i}}+\frac{dw}{dx}\right) = 0$$

$$i = 2, 3, \ldots, N \qquad \text{(C3c)}$$

$$\sum_{i=1}^{N} \left\{G_{44}^{i}\, h_i \left(1+\frac{d_i+\frac{1}{2}h_i}{R}\right)\frac{d^2w}{dx^2} - E_{22}^{i}\,\frac{w}{R}\,\ln\frac{1+d_{i+1}/R}{1+d_i/R}\right.$$

$$+ \left[G_{44}^{i}\left(1+\frac{d_i+\frac{1}{2}h_i}{R}\right) - \frac{1}{2}E_{12}^{i}\,\frac{h_i}{R}\right]\frac{du_{i+1}}{dx}$$

$$\left. - \left[G_{44}^{i}\left(1+\frac{d_i+\frac{1}{2}h_i}{R}\right) + \frac{1}{2}E_{12}^{i}\,\frac{h_i}{R}\right]\frac{du_{i}}{dx}\right\} = 0 \qquad \text{(C3d)}$$

and the boundary conditions at $x = 0, L$ are

$$E_{11}^{1}h_1\left[\frac{1}{3}\left(1+\frac{h_1}{4R}\right)\frac{du}{dx} + \frac{1}{6}\left(1+\frac{h_1}{2R}\right)\frac{du_2}{dx}\right] + \frac{1}{2}E_{12}^{1}\,\frac{h_1}{R}\,w$$

or u prescribed (C4a)

$$E_{11}^{N}h_N\left[\frac{1}{6}\left(1+\frac{d_N+\frac{1}{2}h_N}{R}\right)\frac{du_N}{dx} + \frac{1}{3}\left(1+\frac{d_N+\frac{3}{4}h_N}{R}\right)\frac{du_{N+1}}{dx} + \frac{1}{2}E_{12}^{N}\,\frac{h_N}{R}\,w\right.$$

or u_{N+1} prescribed (C4b)

$$\frac{1}{6}E_{11}^{i-1}\,h_{i-1}\,(1+\frac{d_{i-1}+\frac{1}{2}h_{i-1}}{R})\,\frac{du_{i-1}}{dx}+\frac{1}{3}[E_{11}^{i-1}\,h_{i-1}\,(1+\frac{d_{i-1}+\frac{3}{4}h_{i-1}}{R})$$

$$+\,E_{11}^{i}\,h_i\,(1+\frac{d_i+\frac{1}{4}h_i}{R})]\,\frac{du_i}{dx}+\frac{1}{6}E_{11}^{i}\,h_i(1+\frac{d_i+\frac{1}{2}h_i}{R})\,\frac{du_{i+1}}{dx}$$

$$+\,\frac{1}{2}\,(E_{12}^{i-1}\,h_{i-1}+E_{12}^{i}\,h_i)\,\frac{w}{R}$$

or u_i prescribed, 1 = 2, 3, ..., N (C4c)

$$\sum_{i=1}^{N} G_{44}^{i}\,h_i\,(1+\frac{d_i+\frac{1}{2}h_i}{R})\,(\frac{u_{i+1}-u_i}{h_i}+\frac{dw}{dx}\,)\text{ or }w\text{ prescribed} \qquad \text{(C4d)}$$

A solution can be readily obtained for a single layer edge-loaded shell for which the pertinent equations are

$$\frac{1}{3}(1+\frac{h}{4R})\frac{d^2u_1}{dx^2}-(1+\frac{h}{2R})\frac{G_{44}}{E_{11}h^2}\,u_1+(1+\frac{h}{2R})$$

$$(\frac{1}{6}\frac{d^2u_2}{dx^2}+\frac{G_{44}}{E_{11}h^2}\,u_2)\;+\frac{1}{R}\,[\frac{1}{2}\frac{E_{12}}{E_{11}}+\frac{G_{44}}{E_{11}}\,(\frac{R}{h}+\frac{1}{2})]\,\frac{dw}{dx}$$

$$=0 \qquad \text{(C5a)}$$

$$(1+\frac{h}{2R})\,(\frac{1}{6}\,\frac{d^2u_1}{dx^2}+\frac{G_{44}}{E_{11}h^2}\,u_1)+\frac{1}{3}(1+\frac{3h}{4R})\frac{d^2u_2}{dx^2}$$

$$-(1+\frac{1}{2}\frac{h}{R})\,\frac{G_{44}}{E_{11}h^2}\,u_2+\frac{1}{R}\,[\frac{1}{2}\frac{E_{12}}{E_{11}}-\frac{G_{44}}{E_{11}}\,(\frac{R}{h}+\frac{1}{2})\,]\,\frac{dw}{dx}$$

$$=0 \qquad \text{(C5b)}$$

$$G_{44}h\left(1+\frac{1}{2}\frac{h}{R}\right)\frac{d^2w}{dx^2} - E_{22}\frac{w}{R}\ \ln\left(1+\frac{h}{R}\right)$$

$$+\left[G_{44}\left(1+\frac{1}{2}\frac{h}{R}\right) - \frac{1}{2}E_{12}\frac{h}{R}\right]\frac{du_2}{dx}$$

$$-\left[G_{44}\left(1+\frac{1}{2}\frac{h}{R}\right) + \frac{1}{2}E_{12}\frac{h}{R}\right]\frac{du_1}{dx} = 0 \qquad \text{(C5c)}$$

Let the solution for u_1, u_2 and w be expressed as

$$u_1 = U_1e^{\lambda x/h} \qquad \text{(C6a)}$$

$$u_2 = U_2e^{\lambda x/h} \qquad \text{(C6b)}$$

$$w_3 = We^{\lambda x/h} \qquad \text{(C6c)}$$

Then the substitution of Eqs. (C6) into Eqs. (C5) yields

$$\begin{bmatrix} \frac{1}{3}(1+\frac{1}{4}\frac{h}{R})\lambda^2 - (1+\frac{1}{2}\frac{h}{R})\frac{G_{44}}{E_{11}} & (1+\frac{1}{2}\frac{h}{R})(\frac{1}{6}\lambda^2+\frac{G_{44}}{E_{11}}) & [\frac{1}{2}\frac{E_{12}}{E_{11}}\frac{h}{R}+\frac{G_{44}}{E_{11}}(1+\frac{1}{2}\frac{h}{R})]\lambda \\ (1+\frac{1}{2}\frac{h}{R})(\frac{1}{6}\lambda^2+\frac{G_{44}}{E_{11}}) & \frac{1}{3}(1+\frac{3}{4}\frac{h}{R})\lambda^2 - (1+\frac{1}{2}\frac{h}{R})\frac{G_{44}}{E_{11}} & [\frac{1}{2}\frac{E_{12}}{E_{11}}\frac{h}{R}-\frac{G_{44}}{E_{11}}(1+\frac{1}{2}\frac{h}{R})]\lambda \\ [\frac{1}{2}\frac{E_{12}}{E_{11}}\frac{h}{R}+\frac{G_{44}}{E_{11}}(1+\frac{1}{2}\frac{h}{R})]\lambda & [\frac{1}{2}\frac{E_{12}}{E_{11}}\frac{h}{R}-\frac{G_{44}}{E_{11}}(1+\frac{1}{2}\frac{h}{R})]\lambda & \frac{E_{22}}{E_{11}}\frac{h}{R}\ln(1+\frac{h}{R}) - \frac{G_{44}}{E_{11}}(1+\frac{1}{2}\frac{h}{R})\lambda^2 \end{bmatrix} \begin{Bmatrix} U_1 \\ U_2 \\ W \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \\ 0 \end{Bmatrix} \tag{C7a}$$

from which the characteristic equation for λ is given by

$$\begin{aligned} &\frac{1}{12}\frac{G_{44}}{E_{11}}(1+\frac{1}{2}\frac{h}{R})\ [1+\frac{h}{R}+\frac{1}{6}(\frac{h}{R})^2]\lambda^4 - \frac{1}{12}\{[1+\frac{h}{R}+\frac{1}{6}(\frac{h}{R})^2]\ \frac{h}{R}\frac{E_{22}}{E_{11}}\ln(1+\frac{h}{R}) \\ &\quad -(\frac{E_{12}}{E_{11}})^2(1+\frac{1}{2}\frac{h}{R})(\frac{h}{R})^2 - 2\frac{E_{12}}{E_{11}}(1+\frac{1}{2})(\frac{h}{R})^2\frac{G_{44}}{E_{11}}\}\lambda^2 \\ &\quad +(1+\frac{1}{2}\frac{h}{R})\frac{h}{R}[\frac{E_{22}}{E_{11}}(1+\frac{1}{2}\frac{h}{R})\ln(1+\frac{h}{R}) - (\frac{E_{12}}{E_{11}})^2\frac{h}{R}]\frac{G_{44}}{E_{11}} = 0 \end{aligned} \tag{C7b}$$

ORIGINAL PAGE IS
OF POOR QUALITY

The coefficients U_1 and U_2 are given in terms of W for each value of by the expressions

$$\kappa_{1i} = \frac{U_{1i}}{W_i} = \frac{1}{2\lambda_i\Delta_i} \{[(1+\frac{1}{2}\frac{h}{R})(1+\frac{2}{3}\frac{h}{R})\frac{G_{44}}{E_{11}}$$

$$+\frac{1}{6}\frac{E_{12}}{E_{11}}(1+\frac{h}{R})\frac{h}{R}]\lambda_i^2 - 2\frac{E_{12}G_{44}}{(E_{11})^2}\frac{h}{R}(1+\frac{1}{2}\frac{h}{R})\} \tag{C8a}$$

$$\kappa_{2i} = \frac{U_{2i}}{W_i} = \frac{1}{2\lambda_i\Delta_i} \{[\frac{1}{6}\frac{E_{12}}{E_{11}}\frac{h}{R} - (1+\frac{1}{2}\frac{h}{R})(1+\frac{1}{3}\frac{h}{R})\frac{G_{44}}{E_{11}}]\lambda_i^2$$

$$-2\frac{E_{12}G_{44}}{(E_{11})^2}\frac{h}{R}(1+\frac{1}{2}\frac{h}{R})\} \tag{C8b}$$

$$\Delta_i = (1+\frac{1}{2}\frac{h}{R})^2\frac{G_{44}}{E_{11}} - \frac{1}{12}[1+\frac{h}{R}+\frac{1}{6}(\frac{h}{R})^2]\lambda_i^2$$

$$i = 1, 2, 3, 4 \tag{C8c}$$

Since the solutions of Eq. (C7b) can be expressed as

$$\lambda = \pm\lambda_1, \pm\lambda_2 \tag{C9}$$

the displacements may be expressed as

$$w = A_1 \cosh \lambda_1 \frac{x}{h} + A_2 \sinh \lambda_1 \frac{x}{h} + \cosh \lambda_2 \frac{x}{h} + B_2 \sin h\, \lambda_2 \frac{x}{h}$$

$$u_1 = \kappa_{11}(A_1 \sin h\, \lambda_1 \frac{x}{h} + A_2 \cosh \lambda_1 \frac{x}{h}) + \kappa_{12}(B_1 \sin h\, \lambda_2 \frac{x}{h}$$

$$+ B_2 \cosh \lambda_2 \frac{x}{h} \tag{C10a}$$

$$u_2 = \kappa_{21}(A_1 \;\mathrm{sin\ h}\; \lambda_1 \frac{x}{h} + A_2 \cosh \lambda_1 \frac{x}{h}) + \kappa_{22}(B_1 \;\mathrm{sin\ h}\; \lambda_2 \frac{x}{h}$$

$$+ B_2 \cosh \lambda_2 \frac{x}{h} \qquad \text{(C10b)}$$

Consider a cylinder of length L which is equally loaded at each edge by radial shearing forces. Then the radial deformation is symmetrical about the center of the cylinder length so that the coefficients A_2 and B_2 may be set equal to zero. The boundary conditions at $x = \pm L/2$ to be satisfied by the remaining coefficients are

$$\frac{1}{3}(1 + \frac{1}{4}\frac{h}{R})\frac{du_1}{dx} + \frac{1}{6}(1 + \frac{1}{2}\frac{h}{R}) \frac{du_2}{dx} + \frac{1}{2}\frac{E_{12}}{E_{11}}\frac{w}{R} = 0 \qquad \text{(C11a)}$$

$$\frac{1}{6}(1 + \frac{1}{2}\frac{h}{R})\frac{du_1}{dx} + \frac{1}{3}(1 + \frac{3}{4}\frac{h}{R}) \frac{du_2}{dx} + \frac{1}{2}\frac{E_{12}}{E_{11}}\frac{w}{R} = 0 \qquad \text{(C11b)}$$

$$Gh\ (\frac{u_2 - u_1}{h} + \frac{dw}{dx}) = Q \qquad \text{(C11c)}$$

It should be noted, however, that only one of the first two equations need be satisfied since the sum of the two is automatically satisfied by the solution given. By manipulation, an alternate equation to be satisfied is given by

$$[1 + \frac{h}{R} + \frac{1}{6}(\frac{h}{R})^2]\ \frac{d}{dx}(u_2 - u_1) - \nu \frac{wh}{R^2} = 0 \qquad \text{(C11d)}$$

The equations for the determination of A_1 and B_1 are then

$$\lambda_1\ (1 - \frac{\mu}{\Delta_1})\ A_1 \sinh \lambda_1 \frac{L}{2h} + \lambda_2(1 - \frac{\mu}{\Delta_2})\ B_1 \sinh \lambda_2 \frac{L}{2h} = \frac{Q}{G_{44}} \qquad \text{(C12a)}$$

$$\{\frac{E_{12}}{E_{11}} (\frac{h}{R})^2 + [1 + \frac{h}{R} + \frac{1}{6} (\frac{h}{R})^2] \mu \frac{\lambda_1^2}{\Delta_1} \} A_1 \cosh \lambda_1 \frac{L}{2h}$$

$$+ \{\frac{E_{12}}{E_{11}} (\frac{h}{R})^2 + [1 + \frac{h}{R} + \frac{1}{6} (\frac{h}{R})^2] \mu \frac{\lambda_1}{\Delta_2} B_1 \cosh \lambda_2 \frac{L}{2h} = 0 \qquad \text{(C12b)}$$

with

$$\mu = \frac{G_{44}}{E_{11}} (1 + \frac{1}{2} \frac{h}{R})^2 + \frac{1}{12} \frac{E_{12}}{E_{11}} (\frac{h}{R})^2 \qquad \text{(C12c)}$$

which yield

$$A_1 = -\{\frac{E_{12}}{E_{11}} (\frac{h}{R})^2 + [1 + \frac{h}{R} + \frac{1}{6} (\frac{h}{R})^2] \mu \frac{\lambda_2^2}{\Delta_2} \} \frac{\mu Q}{G_{44}} \frac{\cosh \lambda_2 \frac{L}{2h}}{\Phi} \qquad \text{(C13a)}$$

$$B_1 = +\{\frac{E_{12}}{E_{11}} (\frac{h}{R})^2 + [1 + \frac{h}{R} - \frac{1}{6} (\frac{h}{R})^2] \mu \frac{\lambda_1^2}{\Delta_2} \} \frac{\mu Q}{G_{44}} \frac{\cosh \lambda_1 \frac{L}{2h}}{\Phi} \qquad \text{(C13b)}$$

with

$$\Phi = (\lambda_1 \sinh \lambda_1 \frac{L}{2h} \cosh \lambda_2 \frac{L}{2h} - \lambda_2 \sinh \lambda_2 \frac{L}{2h} \cosh \lambda_1 \frac{L}{2h})$$

$$\{[1 + \frac{h}{R} + \frac{1}{6} (\frac{h}{R})^2] \frac{h}{R} [\frac{E_{22}}{E_{11}} (1 + \frac{1}{2} \frac{h}{R}) \ln (1 + \frac{h}{R})$$

$$- (\frac{E_{12}}{E_{11}})^2 \frac{h}{R} - \frac{1}{12} (\frac{E_{12}}{E_{11}})^2 (\frac{h}{R})^4 \} \qquad \text{(C13c)}$$

Stresses at top and bottom of the shell wall can now be obtained from:

$$\sigma_{xi} = \frac{E_{11}}{h} [(\kappa_{i1} \lambda_1 + \frac{E_{12}}{E_{11}} \frac{h}{R}) A_1 \cosh \lambda_1 \frac{x}{h} + (\kappa_{i2} \lambda_2$$

$$+ \frac{E_{12}}{E_{11}} \frac{h}{R}) B_1 \cosh \lambda_2 \frac{x}{h}] \qquad \text{(C14a)}$$

$$\sigma_{\theta i} = \frac{E_{22}}{h} [(\frac{h}{R} + \frac{E_{12}}{E_{22}} \kappa_{i1}\lambda_1) A_1 \cosh \lambda_1 \frac{x}{h} + (\frac{h}{R}$$

$$+ \frac{E_{12}}{E_{22}} \kappa_{i2}\lambda_2) B_1 \cosh \lambda_2 \frac{x}{h}] \qquad i = 1, 2 \qquad \text{(C14b)}$$

The distribution of transverse shearing stresses can be obtained by integration of the equations of equilibrium for each layer, i.e.,

$$\frac{\partial}{\partial \zeta}\Big[(R + \zeta)\tau_{x\zeta}\Big] + \frac{\partial}{\partial x}\Big[(R + \zeta)\sigma_x\Big] = 0 \qquad \text{(C15a)}$$

But, with σ_x given by

$$\sigma_x = E_{11} [\frac{du_1}{dx}(1 - \frac{\zeta}{h}) + \frac{du_2}{dx}\frac{\zeta}{h} + \frac{E_{12}}{E_{11}}\frac{w}{R + \zeta}] \qquad \text{(C15b)}$$

Eq. (C15a) yields

$$\tau_{x\zeta} = -\frac{E_{11}\zeta}{R + \zeta} \{[R - \frac{1}{2}\zeta(\frac{R}{h} - 1) - \frac{1}{3}\frac{\zeta^2}{h}\Big]\frac{d^2u_1}{dx^2}$$

$$+ \frac{\zeta}{h}(\frac{1}{2}R + \frac{1}{3}\zeta)\frac{d^2u_2}{dx^2} + \frac{E_{12}}{E_{11}}\frac{dw}{dx} \} \qquad \text{(C15c)}$$

The conditions of zero shearing stress at the inner and outer wall surfaces are satisfied since $\tau_{x\zeta}$ from Eq. (C15c) is identically zero at $\zeta = 0$ and vanishes at $\zeta = h$ by virtue of the sum of Eqs. (C5a) and (C5b).

APPENDIX D

DIFFERENTIAL EQUATIONS FOR PLATE AND SHELL ANALYSIS

While partial differential equations for shell layer interface displacements may be obtained with the utilization of the principle of minimum potential energy and integration by parts, the same equations may be derived through the use of the layer equilibrium equations and the stress-strain-displacement relations for the shell. The various equations required are given here. Consider an element of a shell layer (Fig. D-1), which is loaded on its top and bottom surface by interlayer shear and normal stresses and on its sides by force and moment stress resultants. The moments are defined with respect to the layer middle surface. Then the stress-resultant equilibrium equations may be written with the use of Eqs. (2.5.3) to (2.5.7) of Ref. 29

$$\frac{\partial}{\partial\alpha}\left[A^i_\beta\left(\frac{h_i}{2}\right)g_\beta N^i_\alpha\right] + \frac{\partial}{\partial\beta}\left[A^i_\alpha\left(\frac{h_i}{2}\right)g_\alpha N^i_{\beta\alpha}\right]$$

$$+ A^i_\beta\left(\frac{h_i}{2}\right)\frac{\partial g_\alpha}{\partial\beta} N^i_{\alpha\beta} - A^i_\alpha\left(\frac{h_i}{2}\right)\frac{\partial g_\beta}{\partial\alpha} N^i_\beta$$

$$+ g_\alpha g_\beta\left[A^i_\beta\left(\frac{h_i}{2}\right)\frac{Q^i_\alpha}{R_\alpha} + A^i_\alpha(h_i)A^i_\beta(h_i)\tau_{\alpha\rho}^{\ i+1} - A^i_\alpha(o)A^i_\beta(o)\tau_{\alpha\rho}^{\ i}\right] = 0 \tag{D1a}$$

$$\frac{\partial}{\partial\beta}\left[A^i_\alpha\left(\frac{h_i}{2}\right)g_\alpha N^i_\beta + \frac{\partial}{\partial\alpha} A^i_\beta\left(\frac{h_i}{}\right)g_\beta N^i_{\alpha\beta}\right]$$

ORIGINAL PAGE IS
OF POOR QUALITY

$$+ A^i_\alpha\left(\frac{h_i}{2}\right) \frac{\partial g_\beta}{\partial \alpha} N^i_{\beta\alpha} - A^i_\beta\left(\frac{h_i}{2}\right)\frac{\partial g_\alpha}{\partial \beta} N^i_\alpha$$

$$+ g_\alpha g_\beta \; A^i_\alpha\left(\frac{h_i}{2}\right) \frac{Q^i_\beta}{R_\beta} + A^i_\alpha(h_i)A^i_\beta(h_i)\tau_{\beta\zeta}^{i+1} - A^i_\alpha(0)A^i_\beta(0)\tau_{\beta\zeta}^{i} = 0 \tag{D1b}$$

$$\frac{\partial}{\partial\alpha} A^i_\beta\left(\frac{h_i}{2}\right) g_\beta Q^i_\alpha + \frac{\partial}{\partial\beta} A^i_\alpha\left(\frac{h_i}{2}\right) g_\alpha Q^i_\beta$$

$$- g_\alpha g_\beta \; A^i_\beta\left(\frac{h_i}{2}\right)\frac{N^i_\alpha}{R_\alpha} + A^i_\alpha\left(\frac{h_i}{2}\right)\frac{N^i_\beta}{R_\beta}$$

$$- A^i_\alpha(h_i)A^i_\beta(h_i)\sigma_\zeta^{\,i+1} + A^i_\alpha(0)A^i_\beta(0)\sigma_\zeta^{\,i} = 0 \tag{D1c}$$

$$\frac{\partial}{\partial\alpha} A^i_\beta\left(\frac{h_i}{2}\right) g_\beta M^i_\alpha + \frac{\partial}{\partial\beta} A^i_\alpha\left(\frac{h_i}{2}\right) g_\alpha M^i_{\beta\alpha}$$

$$+ A^i_\beta\left(\frac{h_i}{2}\right) \frac{\partial g_\alpha}{\partial \beta} M^i_{\alpha\beta} - A^i_\alpha\left(\frac{h_i}{2}\right) \frac{\partial g_\beta}{\partial\alpha} M^i_\beta$$

$$- g_\alpha g_\beta \; A^i_\alpha\left(\frac{h_i}{2}\right)A^i_\beta\left(\frac{h_i}{2}\right) Q^i_\alpha - \frac{h_i}{2} \; A^i_\alpha(h_i)A^i_\beta(h_i$$

$$\tau^{i+1}_{\alpha\zeta} + A^i_\alpha(0)A^i_\beta(0)\tau^{k}_{\alpha\zeta} = 0. \tag{D1d}$$

$$\frac{\partial}{\partial\beta} A^i_\alpha\left(\frac{h_i}{2}\right) g_\alpha M^i_\beta + \frac{\partial}{\partial\alpha} A^i_\beta\left(\frac{h_i}{2}\right) g_\beta M^i_{\alpha\beta}$$

$$+ A^i_\alpha\left(\frac{h_i}{2}\right)\frac{\partial g_\beta}{\partial\alpha} M^i_{\beta\alpha} - A^i_\beta\left(\frac{h_i}{2}\right)\frac{\partial g_\alpha}{\partial\beta} M^i_\alpha$$

$$- g_\alpha g_\beta \Big\{ A_\alpha^i(\frac{h_i}{2}) A_\beta^i(\frac{h_i}{2}) Q_\beta^i - \frac{h_i}{2} \Big[A_\alpha^i(h_i) A_\beta^i(h_i)$$

$$\tau_{\beta\zeta}^{i+1} + A_\alpha^i(0) A_\beta^i(0) \tau_{\beta\zeta}^i \Big]\Big\} = 0 \qquad \text{(D1e)}$$

$$N_{\alpha\beta}^i - N_{\beta\alpha}^i = \frac{1}{A_\beta^i(\frac{h_i}{2})} \frac{M_{\beta\alpha}^i}{R_\beta} - \frac{1}{A_\alpha^i(\frac{h_i}{2})} \frac{M_{\alpha\beta}^i}{R_\alpha} \; [i = 1,2,\ldots N \qquad \text{(D1f)}$$

From Eqs. (D1a) and (D1d) for the ith layer the following expressions for the interface shear stresses $\tau_{\alpha\zeta}$ may be obtained:

$$\begin{Bmatrix} A_\alpha^i(h_i) A_\beta^i(h_i) \tau_{\alpha\zeta}^{i+1} \\ A_\alpha^i(0) A_\beta^i(0) \tau_{\alpha\zeta}^i \end{Bmatrix} = \begin{Bmatrix} A_\alpha^i(0) \\ A_\alpha^i(h_i) \end{Bmatrix} \frac{2}{h_i} A_\beta^i(\frac{h_i}{2}) Q_\alpha^i$$

$$- \frac{1}{g_\alpha g_\beta} \Big\{ \frac{\partial}{\partial\alpha} \Big[A_\beta^i(\frac{h_i}{2}) g_\beta (\frac{2M_\alpha^i}{h_i} \pm N_\alpha^i) \Big]$$

$$+ \frac{\partial}{\partial\beta} \Big[A_\alpha^i(\frac{h_i}{2}) g_\alpha (\frac{2M_{\beta\alpha}^i}{h_i} \pm N_{\beta\alpha}^i) \Big] + A_\beta^i(\frac{h_i}{2}) \frac{\partial g_\alpha}{\partial\beta} (\frac{2M_{\alpha\beta}^i}{h_i} \pm N_{\alpha\beta}^i)$$

$$- A_\alpha^i(\frac{h_i}{2}) \frac{\partial g_\beta}{\partial\alpha} (\frac{2M_\beta^i}{h_i} \pm N_\beta^i) \Big\} \qquad \text{(D2a)}$$

An alternate expression for $\tau_{\alpha\zeta}^i$ may be obtained from Eqs. (D1a) and (D1d) for the i+1 st layer as

$$A_\alpha^{i-1}(h_{i-1})A_\beta^{i-1}(h_{i-1})\tau_{\alpha\zeta}^{i} = \frac{2}{h_{i+1}} A_\alpha^{i-1}(0)A_\beta^{i-1}(\frac{h_{i-1}}{2})Q_\alpha^{i-1}$$

$$- \frac{1}{g_\alpha g_\beta}\left\{\frac{\partial}{\partial\alpha}\left[A^{i+1}(\frac{h_{i-1}}{2})g_\beta(\frac{2M_\alpha^{i-1}}{h_{i-1}} + N_\alpha^{i-1})\right]\right.$$

$$+ \frac{\partial}{\partial\beta}\left[A_\beta^{i-1}(\frac{h_{i-1}}{2})g_\alpha(\frac{2M_{\beta\alpha}^{i-1}}{h_{i-1}} + N_{\beta\alpha}^{i-1})\right] + A_\beta^{i-1}(\frac{h_{i-1}}{2})\frac{\partial g_\alpha}{\partial\beta}$$

$$\left.(\frac{2M_{\alpha\beta}^{i-1}}{h_{i-1}} + N_{\alpha\beta}^{i-1}) - A_\alpha^{i-1}(\frac{h_{i-1}}{2})\frac{\partial g_\beta}{\partial\alpha}(\frac{2M_\beta^{i-1}}{h_{i-1}} + N_\beta^{i-1})\right\} \qquad \text{(D2b)}$$

Since

$$A_\alpha^{i-1}(h_{i-1}) = A_\alpha^{i}(0) \qquad \text{(D3a)}$$

$$A_\beta^{i-1}(h_{i-1}) = A_\beta^{i}(0) \qquad \text{(D3b)}$$

the elimination of $\tau_{\alpha\zeta}^{i}$ from Eqs. (D2a) and (D2b) yields the following equations of equilibrium

$$\frac{2}{h_i} A_\alpha^{i}(h_i)A_\beta^{i}(\frac{h_i}{2})Q_\alpha^{i} - \frac{2}{h_{i-1}} A_\alpha^{i-1}(0)A_\beta^{i-1}(\frac{h_{i-1}}{2})Q_\alpha^{i-1}$$

ORIGINAL PAGE IS
OF POOR QUALITY

$$- \frac{1}{g_\alpha g_\beta}\frac{\partial}{\partial\alpha}\left\{g_\beta\left[A_\beta^{i}(\frac{h_i}{2})(\frac{2M_\alpha^{i}}{h_i} - N_\alpha^{i}) - A_\beta^{i-1}(\frac{h_{i-1}}{2})\right.\right.$$

ORIGINAL PAGE IS
OF POOR QUALITY

$$\left(\frac{2M_{\alpha}^{i-1}}{h_{i-1}} + N_{\alpha}^{i-1}\right)\Big]\Big]\Big\} + \frac{\partial}{\partial\beta}\Big\{g_{\alpha}\Big[A_{\alpha}^{i}\left(\frac{h_i}{2}\right)\left(\frac{2M_{\beta\alpha}^{i}}{h_i} - N_{\beta\alpha}^{i}\right)$$

$$- A_{\alpha}^{i-1}\left(\frac{h_{i-1}}{2}\right)\left(\frac{2M_{\beta\alpha}^{i-1}}{h_{i-1}} + N_{\beta\alpha}^{i-1}\right)\Big]\Big\} + \frac{\partial g_{\alpha}}{\partial\beta}\Big[A_{\beta}^{i}\left(\frac{h_i}{2}\right)$$

$$\left(\frac{2M_{\alpha\beta}^{i}}{h_i} - N_{\alpha\beta}^{i}\right) - A_{\beta}^{i-1}\left(\frac{h_{i-1}}{2}\right)\left(\frac{2M_{\alpha\beta}^{i-1}}{h_{i-1}} + N_{\alpha\beta}^{i-1}\right)\Big]$$

$$- \frac{\partial g_{\beta}}{\partial\alpha}\Big[A_{\alpha}^{i}\left(\frac{h_i}{2}\right)\left(\frac{2M_{\beta}^{i}}{h_i} - N_{\beta}^{i}\right) - A_{\alpha}^{i-1}\left(\frac{h_{i-1}}{2}\right)\left(\frac{2M_{\beta}^{i-1}}{h_{i-1}} + N_{\beta}^{i-1}\right)\Big] \qquad \text{(D4a)}$$

$$= 0 \qquad\qquad i = 2,3,4,\ldots N$$

together with the inner and outer surface equations

$$\tau_{\alpha\zeta}^{1} = \frac{2}{h_1} A_{\alpha}^{1}(h_1) A_{\beta}^{1}\left(\frac{h_1}{2}\right) Q_{\alpha}^{1}$$

$$- \frac{1}{g_{\alpha}g_{\beta}}\Big\{\frac{\partial}{\partial\alpha}\Big[A_{\beta}^{1}\left(\frac{h_1}{2}\right) g_{\beta}\left(\frac{2M_{\alpha}^{1}}{h_1} - N_{\alpha}^{1}\right)\Big]$$

$$+ \frac{\partial}{\partial\beta}\Big[A_{\alpha}^{1}\left(\frac{h_1}{2}\right) g_{\alpha}\left(\frac{2M_{\beta\alpha}^{1}}{h_1} - N_{\beta\alpha}^{1}\right)\Big] + A_{\beta}^{1}\left(\frac{h_1}{2}\right)\frac{\partial g_{\alpha}}{\partial\beta}$$

$$\left(\frac{2M_{\alpha\beta}^{1}}{h_1} - N_{\alpha\beta}^{1}\right) - A_{\alpha}^{1}\left(\frac{h_1}{2}\right)\frac{\partial g_{\beta}}{\partial\alpha}\left(\frac{2M_{\alpha\beta}^{1}}{h_1} - N_{\beta}^{1}\right) \qquad \text{(D4b)}$$

$$A^N_\alpha(h_N)A^N_\beta(h_N)\tau^{N+1}_{\alpha\zeta} = \frac{2}{h_N} A^N_\alpha(0)A^N_\beta(\frac{h_N}{2})Q^N_\alpha$$

$$- \frac{1}{g_\alpha g_\beta} \frac{\partial}{\partial\alpha} A^N_\beta(\frac{h_N}{2}) g_\beta(\frac{2M^N_\alpha}{h_N} + N^N_\alpha)$$

$$+ \frac{\partial}{\partial\beta} A^N_\alpha(\frac{h_N}{2}) g_\alpha(\frac{2M^N_{\beta\alpha}}{h_N} + N^N_{\beta\alpha}) + A^N_\beta(\frac{h_N}{2}) \frac{\partial g_\alpha}{\partial\beta}$$

$$(\frac{2M^N_{\alpha\beta}}{h_N} + N^N_{\alpha\beta}) - A^N_\alpha(\frac{h_N}{2})\frac{\partial g_\beta}{\partial\alpha}(\frac{2M^N_\beta}{h_N} + N^N_\beta) \tag{D4c}$$

Similar expressions involving $\tau^i_{\beta\zeta}$ may be obtained by interchanging   and   wherever they appear in Eqs. (D2) to (D4). Finally, the interlayer normal stress σ^i_ζ may be eliminated by adding all of Eqs. (D1c) for $i = 1,2,\ldots N$ to obtain

$$\frac{\partial}{\partial\alpha}\left\{g_\beta\left[\sum_{i=1}^{N} A^i_\beta(\frac{h_i}{2})Q^i_\alpha\right]\right\} + \frac{\partial}{\partial\beta}\left\{g_\alpha\left[\sum_{i=1}^{N} A^i_\alpha(\frac{h_i}{2})Q^i_\beta\right]\right\}$$

$$- g_\alpha g_\beta\left[\frac{1}{R_\alpha}\sum_{i=1}^{N} A^i_\beta(\frac{h_i}{2})N^i_\alpha + \frac{1}{R_\beta}\sum_{i=1}^{N} A^i_\alpha(\frac{h_i}{2})N^i_\beta\right.$$

$$\left. - A^N_\alpha(h_N)A^N_\beta(h_N)\sigma_\zeta^{N+1} + \sigma_\zeta^{1}\right] = 0. \tag{D5}$$

To these equations must be appended the constitutive equations for the stress-resultants which are given by

$$\left\{\begin{matrix} A^{i}_{\beta}\ (\frac{h_i}{2})N^{i}_{\alpha} \\ A^{i}_{\alpha}\ (\frac{h_i}{2})N^{i}_{\beta} \\ A^{i}_{\beta}\ (\frac{h_i}{2})N^{i}_{\alpha\beta} \\ A^{i}_{\alpha}\ (\frac{h_i}{2})N^{i}_{\beta\alpha} \\ A^{i}_{\beta}\ (\frac{h_i}{2})M^{i}_{\alpha} \\ A^{i}_{\alpha}\ (\frac{h_i}{2})M^{i}_{\beta} \\ A^{i}_{\beta}\ (\frac{h_i}{2})M^{i}_{\alpha\beta} \\ A^{i}_{\alpha}\ (\frac{h_i}{2})M^{i}_{\beta\alpha} \\ A^{i}_{\beta}\ (\frac{h_i}{2})Q^{i}_{\alpha} \\ A^{i}_{\alpha}\ (\frac{h_i}{2})Q^{i}_{\beta} \end{matrix}\right\} = [C_i]\ \{\bar{\varepsilon}_i\} \qquad \text{(D6)}$$

where

$$[C] = \begin{bmatrix}
E^i_{11}I_{5i}(\beta,\alpha) & E^i_{12}\frac{h_i}{2} & E^i_{13}I_{5i}(\beta,\alpha) & E^i_{13}\frac{h_i}{2} & E^i_{11}I_{6i}(\beta,\alpha) & E^i_{12}\frac{h_i}{2} & E^i_{13}I_{6i}(\beta,\alpha) & E^i_{13}\frac{h_i}{2} & 0 & 0 \\
E^i_{12}\frac{h_i}{2} & E^i_{22}I_{5i}(\alpha,\beta) & E^i_{23}\frac{h_i}{2} & E^i_{23}I_{5i}(\alpha,\beta) & E^i_{12}\frac{h_i}{2} & E^i_{22}I_{6i}(\alpha,\beta) & E^i_{23}\frac{h_i}{2} & E^i_{23}I_{6i}(\alpha,\beta) & 0 & 0 \\
E^i_{13}I_{5i}(\beta,\alpha) & E^i_{23}\frac{h_i}{2} & E^i_{33}I_{5i}(\beta,\alpha) & E^i_{33}\frac{h_i}{2} & E^i_{13}I_{6i}(\beta,\alpha) & E^i_{23}\frac{h_i}{2} & E^i_{33}I_{6i}(\beta,\alpha) & E^i_{33}\frac{h_i}{2} & 0 & 0 \\
E^i_{13}\frac{h_i}{2} & E^i_{23}I_{5i}(\alpha,\beta) & E^i_{33}\frac{h_i}{2} & E^i_{33}I_{5i}(\alpha,\beta) & E^i_{13}\frac{h_i}{2} & E^i_{23}I_{6i}(\alpha,\beta) & E^i_{33}\frac{h_i}{2} & E^i_{33}I_{6i}(\alpha,\beta) & 0 & 0 \\
E^i_{11}I_{7i}(\beta,\alpha) & -E_{12}\frac{h_i^2}{12} & E^i_{13}I_{7i}(\beta,\alpha) & -E^i_{13}\frac{h_i^2}{12} & E^i_{11}I_{8i}(\beta,\alpha) & E^i_{12}\frac{h_i^2}{12} & E^i_{13}I_{8i}(\beta,\alpha) & E^i_{13}\frac{h_i^2}{12} & 0 & 0 \\
-E^i_{12}\frac{h_i^2}{12} & E^i_{22}I_{7i}(\alpha,\beta) & -E^i_{23}\frac{h_i^2}{12} & E^i_{23}I_{7i}(\alpha,\beta) & E^i_{12}\frac{h_i^2}{12} & E^i_{22}I_{8i}(\alpha,\beta) & E^i_{23}\frac{h_i^2}{12} & E^i_{23}I_{8i}(\alpha,\beta) & 0 & 0 \\
E^i_{13}I_{7i}(\beta,\alpha) & -E^i_{23}\frac{h_i^2}{12} & E^i_{33}I_{7i}(\beta,\alpha) & -E^i_{33}\frac{h_i^2}{12} & E^i_{13}I_{8i}(\beta,\alpha) & E^i_{23}\frac{h_i^2}{12} & E^i_{33}I_{8i}(\beta,\alpha) & E^i_{33}\frac{h_i^2}{12} & 0 & 0 \\
-E^i_{13}\frac{h_i^2}{12} & E^i_{23}I_{7i}(\alpha,\beta) & -E^i_{33}\frac{h_i^2}{12} & E^i_{33}I_{7i}(\alpha,\beta) & E^i_{13}\frac{h_i^2}{12} & E^i_{23}I_{8i}(\alpha,\beta) & E^i_{33}\frac{h_i^2}{12} & E^i_{33}I_{8i}(\alpha,\beta) & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & G^i_{44}I_{1i}(\beta,\alpha) & G^i_{45}h_i \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & G^i_{45}h_i & G^i_{55}I_{1i}(\alpha,\beta)
\end{bmatrix} \qquad \text{(D-7)}$$

ORIGINAL PAGE IS
OF POOR QUALITY

and

$$I_{5i}(\mu,\lambda)=\int_{o}^{h_i} (1-\zeta/h_i)\,\frac{A_{\mu}^{i}(\zeta)}{A_{\lambda}^{i}(\zeta)}\,d\zeta = R_{\lambda}\Bigg\{\frac{1}{2}\,\frac{h_i}{R_{\mu}} - (1-\frac{R_{\lambda}}{R_{\mu}}\Bigg[1-(1+\frac{R_{\lambda}+d_i}{h_i})\ln\frac{1+d_{i+1}/R_{\lambda}}{1+d_i/R_{\lambda}}\Bigg]\Bigg\} \tag{D8a}$$

$$I_{6i}(\mu,\lambda)=\int_{o}^{h_i} \zeta/h_i\; A_{\mu}^{i}(\zeta)/A_{\lambda}^{i}(\zeta)\,d\zeta = R_{\lambda}\Bigg[\frac{1}{2}\,\frac{h_i}{R_{\mu}} + (1-\frac{R_{\lambda}}{R_{\mu}})(1-\frac{R_{\lambda}+d_i}{h_i}\ln\frac{1+d_{i+1}/R_{\lambda}}{1+d_i/R_{\lambda}})\Bigg] \tag{D8b}$$

$$I_{7i}(\mu,\lambda) = \int_{o}^{h_i} (\zeta-\frac{h_i}{2})(1-\frac{\zeta}{h_i})\frac{A_{\mu}^{i}(\zeta)}{A_{\lambda}^{i}(\zeta)}\,d\xi = -\,h_iR_{\lambda}\Bigg[\frac{1}{12}\,\frac{h_i}{R_{\lambda}} - (1-\frac{R_{\lambda}}{R_{\mu}})(1+\frac{R_{\lambda}+d_i}{h_i})(1+\frac{1}{2}\ln\frac{1+d_{i+1}/R_{\lambda}}{1+d_i/R_{\lambda}})\Bigg] \tag{D8c}$$

$$I_{8i}(\mu,\lambda) = \int_{o}^{h_i} (\xi-\frac{h_i}{2})(\frac{\zeta}{h_i}\,\frac{A_{\mu}^{i}(\zeta)}{A_{\lambda}^{i}(\zeta)}\,d\zeta = h_iR_{\lambda}\Bigg\{\frac{1}{12}\frac{h_i}{R_{\lambda}} - (1-\frac{R_{\lambda}}{R_{\mu}})(\frac{R_{\lambda}+d_i}{h_i})\Bigg[1-(\frac{1}{2}\,\frac{R_{\lambda}+d_i}{h_i}\ln\frac{1+d_{i+1}/R_{\lambda}}{1+d_i/R_{\lambda}}\Bigg]\Bigg\} \tag{D8d}$$

The various equations may be readily combined for a flat plate to yield the following simultaneous differential equations for the interface displacements

$$\left(\sum_{i=1}^{N} G_{44}^{i}h_{i}\right)\frac{\partial w^{2}}{\partial x^{2}} + 2\left(\sum_{i=1}^{N} G_{45}^{i}h_{i}\right)\frac{\partial w^{2}}{\partial x\partial y} + \left(\sum_{i=1}^{N} G_{55}^{i}h_{i}\right)\frac{\partial w^{2}}{\partial y^{2}}$$

$$+ \sum_{i=1}^{N}\left\{G_{44}^{i}\left(\frac{\partial u_{i+1}}{\partial x} - \frac{\partial u_{i}}{\partial x}\right) + G_{45}^{i}\left[\frac{\partial u_{i+1}}{\partial y} + \frac{\partial v_{i+1}}{\partial x} - \frac{\partial u_{i}}{\partial y} + \frac{\partial v_{i}}{\partial x}\right]\right.$$

$$\left. + G_{55}^{i}\,\frac{\partial v_{i+1}}{\partial y} - \frac{\partial v_{i}}{\partial y}\right\} = q \qquad \text{(D9a)}$$

$$\frac{1}{6}\begin{bmatrix} \frac{\partial}{\partial x} & 0 & \frac{\partial}{\partial y} \\ 0 & \frac{\partial}{\partial y} & \frac{\partial}{\partial x} \end{bmatrix}\left\{h_{i-1}[\tilde{E}_{i-1}]\ \{\tilde{\varepsilon}_{i-1}+2\tilde{\varepsilon}_{i}\}\ (1-\delta_{i,1})+h_{i}[\tilde{E}_{i}]\{2\tilde{\varepsilon}_{i}+\tilde{\varepsilon}_{i+1}\}\right.$$

$$\left.(1-\delta_{i,N+1})\right\} -[G_{i-1}]\{\gamma_{i-1}\}(1-\delta_{i,1})+[G_{i}]\{\gamma_{i}\}(1-\delta_{i,N+1})$$

$$= \begin{cases} \tau_{xz}^{1}\delta_{i,1} - {}^{N+1}_{xz}\delta_{i,N+1} \\ \tau_{yz}^{1}\delta_{i,1} - \tau_{yz}^{N+1}\delta_{i,N+1} \end{cases} \qquad i = 1,2,3\ldots N,N+1 \qquad \text{(D9b)}$$

where

$$[\tilde{E}_{i}] = \begin{bmatrix} E_{11}^{i} & E_{12}^{i} & E_{13}^{i} \\ E_{21}^{i} & E_{22}^{i} & E_{23}^{i} \\ E_{31}^{i} & E_{32}^{i} & E_{33}^{i} \end{bmatrix} \qquad \text{(D10)}$$

$$\left[G_i\right] = \begin{bmatrix} G_{44}^{i} & G_{45}^{i} \\ G_{54}^{i} & G_{55}^{i} \end{bmatrix} \tag{D10b}$$

$$\left\{\tilde{\varepsilon}_i\right\} = \begin{bmatrix} \partial u_i/\partial x \\ \partial v_i/\partial y \\ \partial u_i/\partial y + \partial v_i/\partial x \end{bmatrix} \tag{D10c}$$

$$\left\{\gamma_i\right\} = \begin{bmatrix} \dfrac{u_{i+1}-u_i}{h_i} + \dfrac{\partial w}{\partial x} \\ \dfrac{v_{i+1}-v_i}{h_i} + \dfrac{\partial w}{\partial y} \end{bmatrix} \tag{D10d}$$

ORIGINAL PAGE IS
OF POOR QUALITY